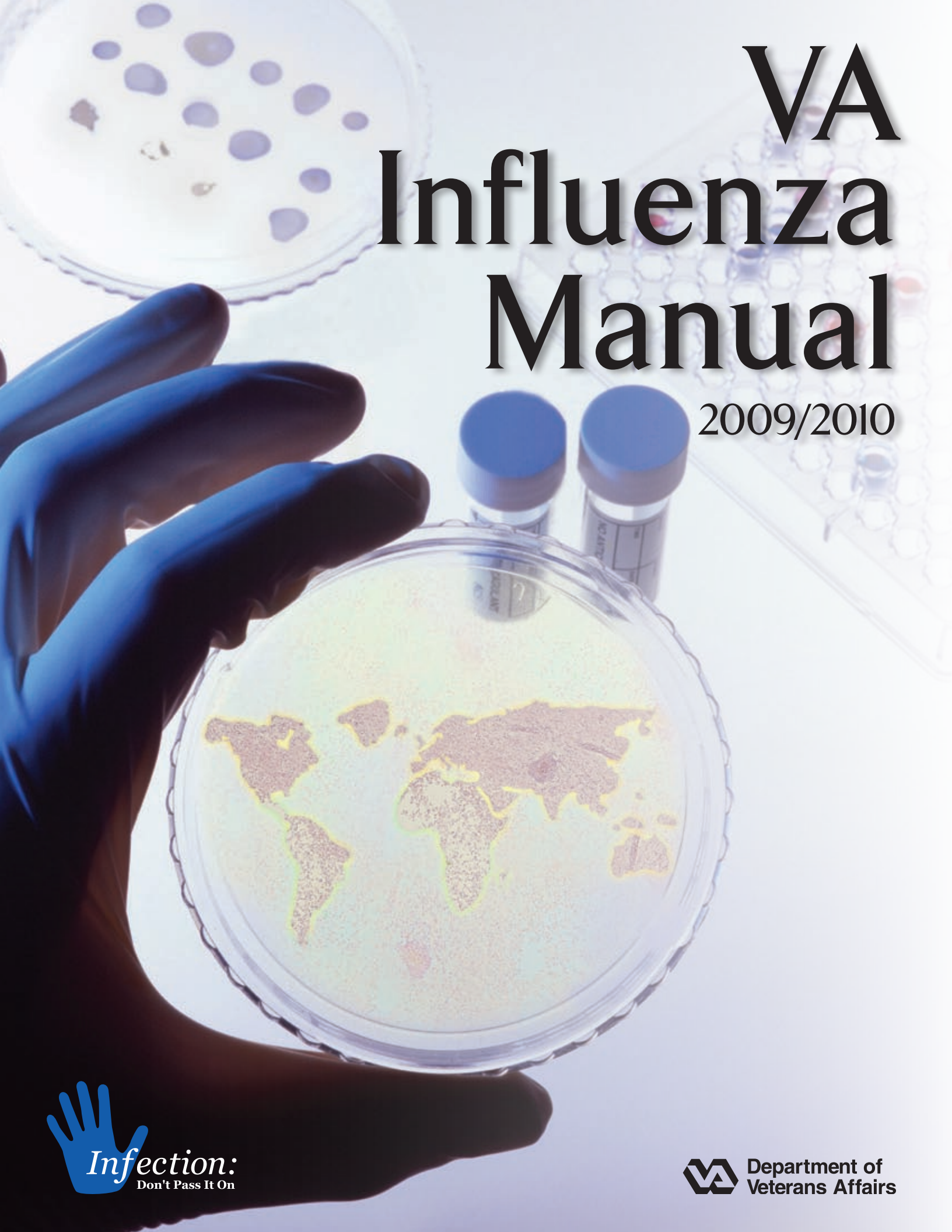


VA Influenza Manual

2009/2010

Infection: Don't Pass It On

Department of Veterans Affairs

VA Influenza Manual

2009/2010

Infection: Don't Pass It On

Campaign Contributing Offices

Office of Public Health & Environmental Hazards
Public Health Strategic Health Care Group
Occupational Health, Safety, and Prevention Strategic Health Care Group

Employee Education System

Office of Patient Care Services
VA Infection Control Professionals
National Center for Health Promotion and Disease Prevention
Infectious Diseases Program Office

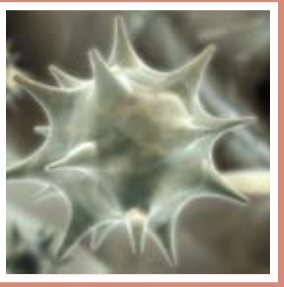
National Center for Patient Safety

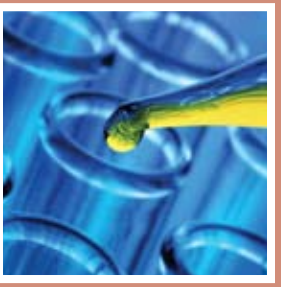
VA Internet sites
www.publichealth.va.gov/flu
www.publichealth.va.gov/InfectionDontPassItOn

VA intranet sites (VA staff only)
vaww.publichealth.va.gov/flu
vaww.publichealth.va.gov/InfectionDontPassItOn

Veterans Health Administration
U.S. Department of Veterans Affairs

Contents





A Message from the Acting Under Secretary for Health

SEASONAL FLU VACCINATION: "NOW MORE THAN EVER"

Seasonal or "regular" influenza, the flu, kills thousands of people every year in this country and hospitalizes over 200,000. That is a huge burden that does not have to happen—we can vaccinate people every year against seasonal flu.

There are at least three essential reasons for doing so:

Flu vaccination is cost-effective

Flu vaccination has been shown by research to be high-impact and highly cost-effective. Aside from what the researchers and policy makers say, compare for yourself, the few dollars and brief discomfort that a flu shot requires (staff and patients who get it at VA are not charged) versus a week of feeling miserable that may involve antiviral treatment, costly hospitalization, or even death.

Flu vaccination is the best protection against seasonal flu

Vaccinating VA staff and Veterans for seasonal flu helps to minimize the spread of flu within VA. Getting vaccinated helps prevent flu related illness in Veterans and health care providers and protects those within our VA community such as family, friends, and coworkers. It also protects you from acquiring flu from them. It can stop the disease in its tracks, before it takes hold. That's a pretty powerful argument.

Flu vaccination enables us to be better prepared for other health challenges

As my colleague Dr. Kristin Nichol states in her introduction, this year more than ever, seasonal flu vaccination is important for all of us. Let's get this key but simple health step done. This year we have an added challenge—an entirely new flu virus is circulating in the world and the US, the novel influenza A H1N1 virus. As I write this, the Centers for Disease Control and Prevention has just estimated that a million people in the US have been infected. Many more are affected world-wide. Currently, H1N1 appears to be relatively mild, and I hope by the time you read this and implement your seasonal flu vaccine programs, it is still mild. Thus far, the impact of H1N1 (that is, deaths and hospitalizations) has been higher in parts of the world where there is less access to good disease prevention and care. The US has a robust health system and of course VA provides "the best care anywhere." But let's make sure that via our seasonal flu programs as well as continued attention to other basic public health measures like hand washing and respiratory hygiene—we keep ourselves and the VA community healthy.

Our seasonal flu vaccination campaign is one we can be especially proud of for rates meeting or exceeding other programs in this country. For example, in some of our medical centers, our flu vaccination rates approach 90 percent of elderly patients. We strive toward our goal of vaccinating at least 75 percent of all our patients. In addition, we continue to be challenged in our efforts to increase the vaccination rate of specific VA groups. For example, rates of vaccination of female patients are lower than vaccination rates of male patients. Our goal this year is

Gerald M. Cross, MD, FAAFP
Acting Under Secretary for Health
Veterans Health Administration

Compare for yourself the brief discomfort of a flu shot versus a week of feeling miserable that may involve antiviral treatment, costly hospitalization, or even death.

Thank you for getting vaccinated yourself and for all you do to vaccinate patients and staff against seasonal flu, an easily preventable illness.

to close that gap! Fiscal Year (FY) 2008 rates of vaccination of patients ages 50–64 years was significantly lower (69 percent) compared to 84 percent vaccination rate of those age 65 and older. We continue toward our 2011 goal of vaccinating 80 percent of our employees. During FY 2009, 64 percent of our employees were vaccinated, a rate far above the national average of 40 percent for health care workers in the US. In VA, we encourage vaccination of all staff (employees, contractors, trainees, volunteers), and all enrolled patients including those under the age of 50.

With the ongoing H1N1 pandemic and seasonal flu occurring fall, winter, and spring, it seems like the flu is ever present. Yet it is essential that we prevent this common disease, however and whenever it presents itself.

Thank you for getting vaccinated yourself and for all you do to vaccinate patients and staff against seasonal flu, an easily preventable illness. In addition, I know many of you are involved in the important work of H1N1 preparedness and response. We appreciate your hard work on behalf of Veterans and the VA health care system!

A Message from Dr. Kristin Nichol

Influenza is on everyone's minds these days. On June 11, 2009, the World Health Organization (WHO) raised the worldwide pandemic alert level to Phase 6, meaning that a global pandemic is underway.

The novel H1N1 influenza virus was first identified in April, and we are still learning about the severity and other epidemiologic features of this virus. Just how this novel H1N1 influenza pandemic will continue to unfold is uncertain.

Even as we respond to this H1N1 pandemic, it is important that we also prepare for seasonal influenza. This year it is more important than ever that we do everything we can to prevent and control seasonal influenza. Remember that seasonal influenza can be a serious and even fatal disease for our Veterans. Just about everyone can benefit from vaccination. Especially high priority groups for vaccination include those at highest risk for complications from influenza that might result in hospitalization or death such as the elderly, all residents of long term care facilities (i.e., community living centers and domiciliaries), pregnant women, and others with chronic medical conditions (e.g., diabetes, heart disease, lung disease ,cancer and HIV infection.). For these Veterans, vaccination can be life saving.

Health care workers and other employees in the health care setting are also included among those targeted for annual vaccination. Influenza vaccination helps health care workers protect themselves and their patients. Adults who have been infected by influenza viruses may shed virus and be infectious for 24 hours or so *before* the onset of symptoms and for 4 to 5 days or even longer after the onset of symptoms. Unfortunately, infected health care workers may therefore come to work while they are shedding virus, thereby exposing vulnerable patients and co-workers to the risk of influenza. Health care workers and other health care employees who get vaccinated reduce their chances of acquiring or spreading seasonal flu.

Critical to the effective prevention and control of influenza—whether pandemic or seasonal influenza—is accurate knowledge of the disease, the safety and benefits of vaccination, and tools to develop and implement effective vaccination campaigns. VHA will provide timely guidance and frequent updates on H1N1 and its potential impact on seasonal influenza over the coming months as additional information becomes available. More than ever, infection control measures should be implemented, and antiviral treatment should be considered especially for patients with serious illness. Education should be promoted on general measures such as hand hygiene, cough etiquette, and staying home if ill. All are also important strategies for preventing the transmission of influenza, including H1N1 illness. We should all be proud that the VHA is a national leader when it comes to vaccinating patients and employees in our facilities. But we still have a way to go. The *2009–2010 VA Influenza Manual* is here to help. Let's go out and get it done!

Kristin Nichol, MD, MPH, MBA
Associate Chief of Staff for Research
Minneapolis VA Medical Center

Goals of the VA Influenza Vaccination Program, 2009–2010

Each year the *Infection: Don't Pass It On (IDPIO)* campaign team coordinates the development of goals for the upcoming flu vaccination season.

The goal for employees (#1) is set in concert with the Occupational Health, Safety, & Prevention Strategic Health Care Group. To meet the performance monitor this year, facilities will need to vaccinate 70 percent of their employees. To exceed the performance monitor, 75 percent of staff will need to get vaccinated for influenza. VHA has set a goal of employee vaccination rate of 80 percent by 2011.

The goal for patients (#2) is set in concert with the Office of Quality and Performance and the Public Health Strategic Health Care Group.

Patient goal (#3) reflects data available to IDPIO, which indicate that women veteran patients are vaccinated at rates lower than the male veteran patient population.

Goals of the VA Influenza Vaccination Program, 2009–2010

1. Within each VA health care facility, increase the seasonal influenza vaccination rate of employees to at least 70 percent.
2. Within each VA health care facility, increase the seasonal influenza vaccination rate of Veteran patients to at least 75 percent.
3. Within each VA health care facility, increase the seasonal influenza vaccination rate of women Veteran patients to at least 75 percent.
4. Promote prevention, education, and vaccine recommendations for novel influenza A (H1N1) virus.
5. Promote consistent and proper documentation and tracking for all influenza vaccinations.
6. Promote non-vaccine methods of preventing infection, particularly hand hygiene and respiratory etiquette.
7. Encourage the entire VA health care community to promote and support influenza vaccination.

Section I

Vaccine Information

Vaccine Information

New Information from Centers for Disease Control and Prevention

1. The Advisory Committee on Immunization Practices (ACIP) is emphasizing annual influenza vaccination of all children ages 6 months to 18 years of age. Studies have indicated the benefits of vaccinating children may extend protection to adults who have contact with them by reducing influenza-related complications in household or community contacts. Follow ACIP recommendations for ages, timing, and dosage. Note: Children less than 6 months cannot receive influenza vaccination.
2. Annual vaccination against influenza is recommended for any adult wanting to reduce the risk of becoming ill with influenza or transmitting it to others.
3. Updated antiviral treatment and chemoprophylaxis recommendations will be provided in a separate set of guidelines later in 2009. This will be available from ACIP before the start of the 2009–2010 influenza season. CDC has interim recommendations for antiviral treatment and chemoprophylaxis for seasonal influenza due to growing oseltamivir resistance and these guidelines should be consulted pending issuance of new recommendations. http://www2a.cdc.gov/HAN/ArchiveSys/ViewMsgV.asp?AlertNum=00279.

   New guidance on clinical management of influenza, including use of antivirals, also is available from the Infectious Diseases Society of America. Oseltamavir or zanamivir continue to be the antiviral agents recommended during the 2009–2010 influenza season for seasonal influenza until new guidelines are published.
4. A novel influenza A (H1N1) virus similar to influenza in swine has been determined to be the cause of the influenza respiratory illness that spread across North America and into many areas of the world in Spring 2009. Symptoms of the H1N1 viral infection are similar to seasonal influenza and specific diagnostic testing is required to distinguish this viral infection from seasonal influenza. Vaccines are currently being developed that are specific to novel influenza A (H1N1) virus. Prevention issues related to this newly emerging influenza will be published separately in 2009.
5. ACIP emphasizes influenza vaccinations and vaccination clinics should be scheduled as early as vaccine is available and continue throughout the remainder of the influenza season. One of the *Healthy People 2010* objectives includes a vaccination level of 90% for those over 65 and among nursing home residents.
6. Live, attenuated seasonal influenza vaccine (LAIV) continues to be recommended for **healthy** person's ages 2–49 years of age **who are not pregnant**. Trivalent inactivated influenza vaccine (TIV) is still indicated for patients 6 months and older including those with high risk conditions. Thimerosal free vaccine is required for ages 6–35 months.
7. CDC has developed a contingency plan for timing and prioritization of administering influenza vaccine if supply is delayed or reduced. A copy is provided at the end of this section.

Commitment to a Healthy VA Community

We continue to plan and prepare for the threat of an influenza pandemic and it is more important than ever that our Veterans, employees, trainees, and volunteers maintain their health. Getting vaccinated for seasonal influenza is just one step individuals can take toward keeping their immune systems strong. VA's active seasonal flu campaign is an example of our commitment to save lives and resources, and to keep our VA community healthy.

VA Influenza Sales History (Doses)			
YEAR	Syringe	Vial	Total
1998–1999	766,310	220,220	986,530
1999–2000	295,760	867,490	1,163,250
2000–2001	382,250	1,079,030	1,461,280
2001–2002	339,650	1,502,110	1,841,760
2002–2003	414,400	1,172,850	1,587,250
2003–2004	325,050	1,724,700	2,620,000
2004–2005	367,920	1,822,310	2,190,230
2005–2006	0	2,231,060	2,231,060
2006–2007	1,020,600	1,289,340	2,309,940
2007–2008	876,085	1,440,570	2,316,655
2008–2009	1,417,850	1,123,730	2,541,580
2009–2010 (est)	2,280,000	1,720,000	4,000,000

VA FLU UPDATES:
VA staff and providers can review the latest information on 2009–2010 influenza vaccine found in flu advisories, tips, and other updates on e-mail and on the Web: www.publichealth.va.gov/flu
Or the VA intranet *vaww*.publichealth.va.gov/flu

Influenza Vaccine Supplies

In 2009, the Pharmacy Benefits Management Strategic Health Care Group (PBM) awarded national contracts to CSL Biotherapies, Inc, and Novartis for influenza vaccine for the 2009–2010 flu season. CSL Biotherapies, Inc. will provide pre-filled single dose syringes and Novartis will provide multi-dose vials. The ordering deadline for both contracts was July 15, 2009. See the Figure 1 on page I/3 for an overview of influenza vaccine production.

Vaccine Delivery

The dates of vaccine delivery have been set according to contract specifications. Those are:

Facilities should begin offering seasonal flu vaccination as soon as vaccine arrives.

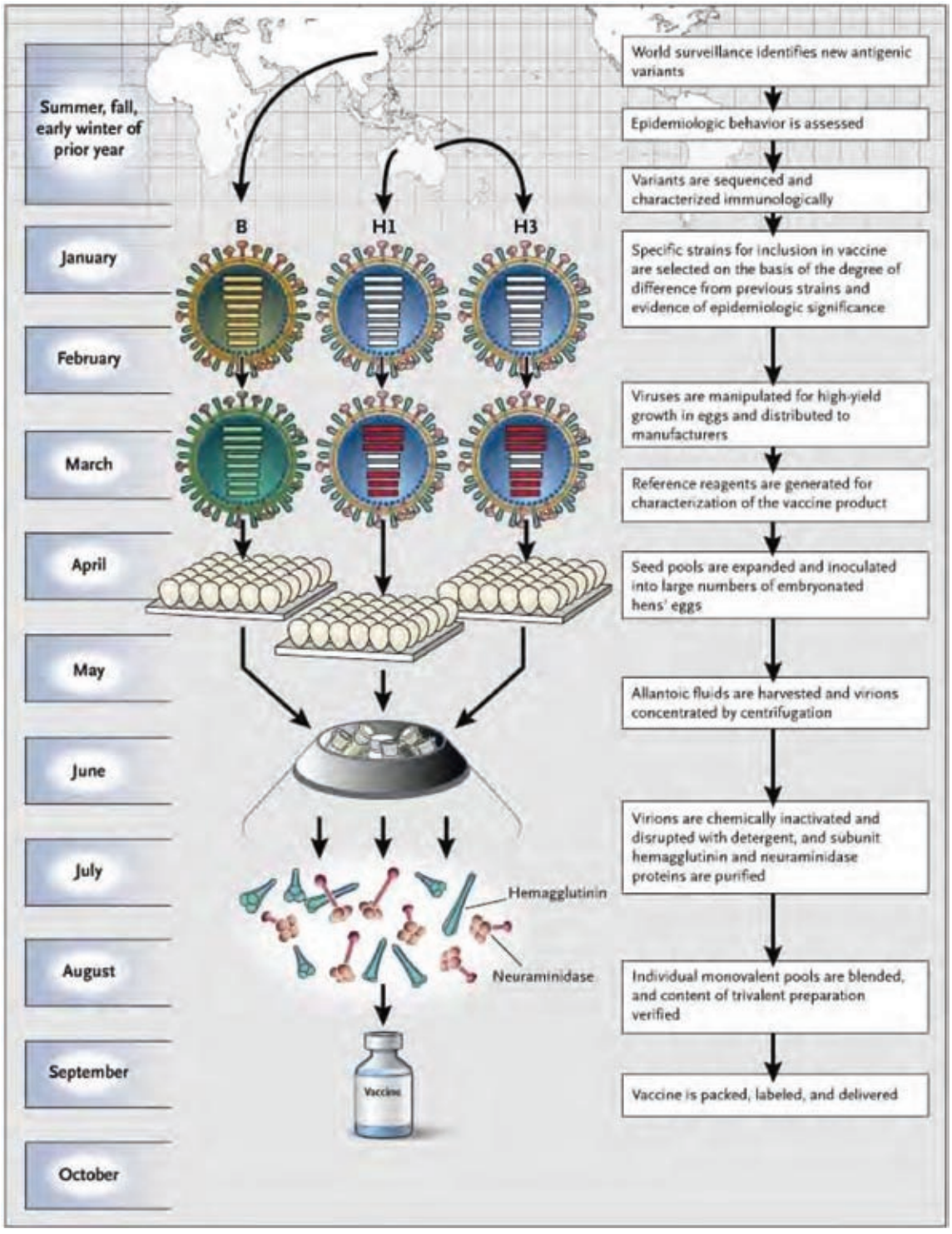
- CSL Biotherapies, Inc. (single-dose syringes): Full or partial shipments of at least 25% in August 2009, 75% September 15, 2009, and 100% by September 30, 2009
- Novartis: Shipment will be made with customers receiving 100% of order by September 30, 2009

Flu coordinators and other VA staff involved in implementing the influenza vaccination campaign at each facility should contact their Pharmacy Chief regarding vaccine availability, type of vaccine dosing ordered, and quantities.

Additional Material and Supply Considerations

Facilities should consider what additional supplies are necessary to implement their seasonal influenza vaccination program, such as safety needles for vaccine packaged in individual doses, and safety needles and syringes for vaccines that come in multidose vials. Other supply needs for vaccination such as alcohol swabs, gloves, sharps disposal containers, vaccine information sheets, tables, chairs, clipboards and personnel responsible for giving vaccinations should be planned.

Figure 1 · Influenza Vaccine Production



REMINDER:
Give the CDC Vaccine Information Statement (VIS) prior to administration of vaccine.

Finally, in planning influenza vaccination events and clinics, facilities should keep in mind the delivery dates and quantities of vaccine.

Vaccine programs may employ both forms of influenza vaccine: inactivated (injectable) and live, attenuated (intranasal) influenza vaccine for those facilities who wish to do so.

A vaccine against the novel influenza A (H1N1) virus is being produced and discussion is underway to provide as a separate injection.

Who should be vaccinated?

In general, anyone who wants to reduce their chances of getting the flu or of transmitting influenza to others should be vaccinated. The updated 2009 Advisory Committee on Immunization Practices (ACIP) of CDC recommends all people who have no contraindications to the vaccine should get vaccinated each year including all children ages 6 months to 18 years. Of special focus are persons who are at high risk of having serious flu complications and people who live with or care for those at high risk for serious complications. VA recommends the following when considering who should be vaccinated:

Persons at high risk from influenza, including:

1. Adults aged 50 years and older
2. All women who will be pregnant during the influenza season
3. Residents of Community Living Centers and long-term care facilities
4. Persons of any age with underlying chronic medical conditions
   - Persons who have chronic pulmonary (including asthma), cardiovascular (except hypertension), renal, hepatic, cognitive, neurologic/neuromuscular, hematological or metabolic disorders (including diabetes mellitus)
5. Persons who have immunosuppression (including immunosuppression caused by medications or by human immunodeficiency virus)
6. All children age 6 months to 18 years of age including those who have underlying medical conditions

Persons who live with or care for those at high risk for complications from flu:

1. Health care workers and VHA staff;
2. Healthy household contacts and caregivers of persons medically at high risk for complications of influenza illness; and
3. Healthy out-of-home contacts and caregivers of adults over the age of 50 and of children less than 5 years of age with special emphasis on caregivers of infants less than 6 months of age.

Persons who wish to be vaccinated:

1. Vaccination is recommended for all adults who want to reduce the risk of becoming ill with influenza or of transmitting it to others and who have no contraindications to the vaccine.

Inactivated (Injectable) Influenza Vaccine 2009–2010

The 2009–2010 trivalent influenza vaccine (TIV) for the United States will contain:

- A/Brisbane/59/2007 (H1N1)-like antigen
- A/Brisbane/10/2007 (H3N2)-like antigen
- B/Brisbane/60/2008-like antigen

1. Trivalent injectable vaccines are made noninfectious (i.e., inactivated or killed) and thus cannot cause influenza.
2. TIV is administered by intramuscular injection only. On an adult, the deltoid muscle of the arm is the preferred site.
3. TIV is licensed for use among persons aged 6 months and older including those who are healthy and those with chronic medical conditions. Thimerosal free vaccine is required for ages 6–35 months.
4. TIV should be given to children (6–59 months) who have asthma or medical conditions that put them at higher risk for influenza complications.
5. TIV can be given to persons at risk for medical complications:
   - All persons aged >50 years of age
   - Women who will be pregnant during the influenza season
   - Adults and children who have chronic pulmonary (including asthma), cardiovascular (except hypertension), renal, hepatic, cognitive, neurological/neuromuscular, hematologic or metabolic disorders (including diabetes mellitus). Adults and children who have immunosuppression (including caused by medications or HIV)
   - Residents of nursing homes and other long-term-care facilities

Remember, prior to administration of the influenza vaccine; provide to the recipient the Inactivated Influenza Vaccine CDC vaccine information statement (VIS).

As with all vaccines, monitor and maintain the vaccine temperature between 2–8 degrees Centigrade (35–46°F) when received and use before the expiration date. Monitor temperature two times daily.

http://www.cdc.gov/vaccines/pubs/vis/downloads/vis-flu.pdf

INACTIVATED INFLUENZA VACCINE

WHAT YOU NEED TO KNOW 2009-10

Many Vaccine Information Statements are available in Spanish and other languages. See www.immunize.org/vis.

1 Why get vaccinated?

Influenza ("flu") is a contagious disease.

It is caused by the influenza virus, which can be spread by coughing, sneezing, or nasal secretions.

Other illnesses can have the same symptoms and are often mistaken for influenza. But only an illness caused by the influenza virus is really influenza.

Anyone can get influenza, but rates of infection are highest among children. For most people, it lasts only a few days. It can cause:

- fever
- sore throat
- chills
- fatigue
- cough
- headache
- muscle aches

Some people, such as infants, elderly, and those with certain health conditions, can get much sicker. Flu can cause high fever and pneumonia, and make existing medical conditions worse. It can cause diarrhea and seizures in children. On average, 226,000 people are hospitalized every year because of influenza and 36,000 die – mostly elderly. **Influenza vaccine can prevent influenza.**

2 Inactivated influenza vaccine

There are two types of seasonal influenza vaccine:

1. **Inactivated** (killed) vaccine, or the "flu shot" is given by injection into the muscle. 2. **Live, attenuated** (weakened) influenza vaccine is sprayed into the nostrils. *This vaccine is described in a separate Vaccine Information Statement.*

These "seasonal" influenza vaccines are formulated to prevent annual flu. They do not protect against pandemic H1N1 influenza.

Influenza viruses are always changing. Because of this, influenza vaccines are updated every year, and an annual vaccination is recommended.

Each year scientists try to match the viruses in the vaccine to those most likely to cause flu that year. When there is a close match the vaccine protects most people from serious influenza-related illness. But even when there is not a close match, the vaccine provides some protection. Influenza vaccine will *not* prevent "influenza-like" illnesses caused by other viruses.

It takes up to 2 weeks for protection to develop after the shot. Protection lasts up to a year.

Some inactivated influenza vaccine contains a preservative called thimerosal. Some people have suggested that thimerosal may be related to developmental problems in children. In 2004 the Institute of Medicine reviewed many studies looking into this theory and concluded that there is no evidence of such a relationship. Thimerosal-free influenza vaccine is available.

3 Who should get inactivated influenza vaccine?

*Anyone who wants to **reduce the likelihood of becoming ill** with influenza or **spreading influenza to others**.*

*All children **6 months and older** and all **older adults**:*

- All children from 6 months through 18 years of age.
- Anyone 50 years of age or older.

*Anyone who is **at risk of complications from influenza**, or more **likely to require medical care**:*

- Women who will be **pregnant** during influenza season.
- Anyone with **long-term health problems** with:
  - heart disease
  - kidney disease
  - liver disease
  - lung disease
  - metabolic disease, such as diabetes
  - asthma
  - anemia, and other blood disorders
- Anyone with a **weakened immune system** due to:
  - HIV/AIDS or other diseases affecting the immune system
  - long-term treatment with drugs such as steroids
  - cancer treatment with x-rays or drugs
- Anyone with certain **muscle or nerve disorders** (such as seizure disorders or cerebral palsy) that can lead to breathing or swallowing problems.
- Anyone 6 months through 18 years of age on **long-term aspirin treatment** (they could develop Reye Syndrome if they got influenza).
- **Residents of nursing homes** and other **chronic-care facilities**.

Anyone who lives with or cares for people at high risk for influenza-related complications:

- **Health care providers**.
- **Household contacts and caregivers of children** from birth up to 5 years of age.
- **Household contacts and caregivers** of
  - people 50 years and older, or
  - anyone with medical conditions that put them at higher risk for severe complications from influenza.

Health care providers may also recommend a yearly influenza vaccination for:

- People who provide **essential community services**.
- People living in **dormitories, correctional facilities**, or under other **crowded conditions**, to prevent outbreaks.
- People at high risk of influenza complications who **travel** to the Southern hemisphere between April and September, or to the tropics or in organized tourist groups at any time.

4 When should I get influenza vaccine?

You can get the vaccine as soon as it is available, usually in the fall, and for as long as illness is occurring in your community. Influenza can occur any time from November through May, but it most often peaks in January or February. Getting vaccinated in December, or even later, will still be beneficial in most years.

Most people need one dose of influenza vaccine each year. **Children younger than 9 years of age getting influenza vaccine for the first time** – or who got influenza vaccine for the first time last season but got only one dose – should get 2 doses, at least 4 weeks apart, to be protected.

Influenza vaccine may be given at the same time as other vaccines, including pneumococcal vaccine.

5 Some people should talk with a doctor before getting influenza vaccine

Some people should not get inactivated influenza vaccine or should wait before getting it.

- Tell your doctor if you have any **severe** (life-threatening) allergies. Allergic reactions to influenza vaccine are rare.
  - Influenza vaccine virus is grown in eggs. People with a severe egg allergy should not get the vaccine.
  - A severe allergy to any vaccine component is also a reason to not get the vaccine.
  - If you have had a severe reaction after a previous dose of influenza vaccine, tell your doctor.
- Tell your doctor if you ever had Guillain-Barré Syndrome (a severe paralytic illness, also called GBS). You may be able to get the vaccine, but your doctor should help you make the decision.
- People who are moderately or severely ill should usually wait until they recover before getting flu vaccine. If you are ill, talk to your doctor or nurse about whether to reschedule the vaccination. People with a mild illness can usually get the vaccine.

6 What are the risks from inactivated influenza vaccine?

A vaccine, like any medicine, could possibly cause serious problems, such as severe allergic reactions. The risk of a vaccine causing serious harm, or death, is extremely small.

Serious problems from influenza vaccine are very rare. The viruses in inactivated influenza vaccine have been killed, so you cannot get influenza from the vaccine.

Mild problems:

• soreness, redness, or swelling where the shot was given
• hoarseness; sore, red or itchy eyes; cough
• fever • aches

If these problems occur, they usually begin soon after the shot and last 1-2 days.

Severe problems:

- Life-threatening allergic reactions from vaccines are very rare. If they do occur, it is usually within a few minutes to a few hours after the shot.
- In 1976, a type of influenza (swine flu) vaccine was associated with Guillain-Barré Syndrome (GBS). Since then, flu vaccines have not been clearly linked to GBS. However, if there is a risk of GBS from current flu vaccines, it would be no more than 1 or 2 cases per million people vaccinated. This is much lower than the risk of severe influenza, which can be prevented by vaccination.

7 What if there is a severe reaction?

What should I look for?

Any unusual condition, such as a high fever or behavior changes. Signs of a severe allergic reaction can include difficulty breathing, hoarseness or wheezing, hives, paleness, weakness, a fast heart beat or dizziness.

What should I do?

- **Call** a doctor, or get the person to a doctor right away.
- **Tell** the doctor what happened, the date and time it happened, and when the vaccination was given.
- **Ask** your provider to report the reaction by filing a Vaccine Adverse Event Reporting System (VAERS) form. Or you can file this report through the VAERS website at www.vaers.hhs.gov, or by calling 1-800-822-7967.

VAERS does not provide medical advice.

8 The National Vaccine Injury Compensation Program

A federal program exists to help pay for the care of anyone who has a serious reaction to a vaccine.

For more information about the National Vaccine Injury Compensation Program, call **1-800-338-2382**, or visit their website at **www.hrsa.gov/vaccinecompensation**.

9 How can I learn more?

- Ask your provider. They can give you the vaccine package insert or suggest other sources of information.
- Call your local or state health department.
- Contact the Centers for Disease Control and Prevention (CDC):
  - Call **1-800-232-4636** (**1-800-CDC-INFO**) or
  - Visit CDC's website at **www.cdc.gov/flu**

DEPARTMENT OF HEALTH AND HUMAN SERVICES
CENTERS FOR DISEASE CONTROL AND PREVENTION

Vaccine Information Statement (Interim)
Inactivated Influenza Vaccine (8/11/09) 42 U.S.C. §300aa-26

Live, Attenuated Intranasal Influenza Vaccine (LAIV) 2009–2010

The 2009–2010 live attenuated influenza vaccine (LAIV) for the United States will contain:

- A/Brisbane/59/2007 (H1N1)-like antigen
- A/Brisbane/10/2007 (H3N2)-like antigen
- B/Brisbane/60/2008-like antigen

Remember, prior to administration of the influenza vaccine, provide to the recipient the Live, Attenuated Intranasal Influenza Vaccine (LAIV) CDC vaccine information statement (VIS).

1. A single **LAIV** is licensed in the United States: FluMist® (MedImmune, Inc.). LAIV is a live, trivalent, intranasally administered vaccine that induces broad mucosal and systemic immune response. The vaccine is composed of a cold-adapted, temperature-sensitive virus that is only efficient at replicating in the temperature present in the nasal mucosa. For the 2009–2010 influenza season, there are no changes from the 2007 basic formula only changes in the influenza strains. LAIV should be stored in a refrigerator between 2–8 degrees Centigrade (35–46°F) when received and used before the expiration date. LAIV is thimerosal free. **DO NOT FREEZE**.
   - **In general, LAIV is an option for vaccinating healthy VHA employees, trainees, volunteers, and Veterans under the age of 50.** VA health care facilities may use it whether or not there is a shortage of inactivated (injectable) vaccine. But, especially in the event of a shortage of inactivated vaccine, use of LAIV conserves inactivated vaccine for those who are not eligible to receive LAIV.

At this time, the VA does not have a specific contract for purchasing LAIV for our seasonal flu vaccine programs. Individual facilities may choose to order and administer this type of flu vaccine for specific recommended groups.

   - **Side effects** that may occur after administration of LAIV include runny nose, nasal congestion, headache, sore throat, and cough.
2. **LAIV should *NOT* be given to**:
   - people who are 50 or over, or children under 2 years old
   - anyone with history of hypersensitivity, or anaphylactic reaction, to any component of FluMist®
   - those allergic to eggs or egg products, gentamicin, gelatin, or arginine
   - persons who:
     - Have had a severe allergic reaction to previous influenza vaccinations (e.g., rash, hives, itching, difficulty breathing, tightness in the chest, swelling of the mouth, face, lips, or tongue)
     - Children and adolescents (6 months–18 years of age) receiving aspirin or aspirin-containing therapy (or another salicylate)
     - Any person with asthma or children younger than 5 years with recurrent wheezing
     - Pregnant women
   - Persons with these underlying medical condition
     - Heart disease
     - Lung disease
     - Kidney disease
     - Liver disease
     - Immunosuppressed/ immunodeficiency disease
     - Diabetes
     - Anemia or other blood disorders
     - Muscle or nerve disorders (i.e., seizure disorders or cerebral palsy)
     - History of Guillain-Barré Syndrome

3. **Employees, trainees, and volunteers who work with *severely* immunosuppressed persons *should not* be vaccinated with LAIV** (i.e., patients who are in hospital in a protective environment that is typically defined as a specialized patient-care area with a positive airflow relative to the corridor, high-efficiency particulate air filtration, and frequent air changes).
4. **Severely immunosuppressed persons should *NOT* administer LAIV to others** because of the small risk of acquiring vaccine virus from the environment during administration.
5. **LAIV *MAY* be administered** to others by persons considered at high risk of influenza complications (including persons 50 years old or older, pregnant women, those who have asthma, cystic fibrosis, or chronic obstructive pulmonary disease; those with chronic metabolic disease like diabetes, those with renal disease, etc.).
6. Consideration for ***restrictions*** at work after receiving LAIV: The rationale for avoiding use of LAIV among HCP or other close contacts of severely immunocompromised patients is the theoretical risk that a live, attenuated vaccine virus could be transmitted to the severely immunosuppressed person. As a precautionary measure, HCP who receive LAIV should avoid providing care for severely immunosuppressed patients requiring a protected environment for 7 days after vaccination. Visitors, trainees, and volunteers who work with *severely* immunocompromised patients should refrain from contact with that risk group for seven days after receiving LAIV.
7. HCP's, visitors, trainees, or volunteers who have close contact with persons with lesser degrees of immunosuppression (diabetes, asthmatics on corticosteroids, persons who have recently received chemo or radiation therapy, or persons infected with HIV) may not require restrictions based on facility policy.
8. At this time, **VA does not have a specific contract for purchasing LAIV** for our seasonal flu vaccine programs. Individual facilities may choose to order and administer this type of flu vaccine for specific recommended groups. The use needs to be according to the current CDC ACIP guidelines. The ordering and administration of this formulation of flu vaccine would be coordinated through your Pharmacy and Flu Vaccine committee.

References:

- Package Insert (Circular); Influenza virus Vaccine Live, Intranasal FluMist®, June 2009
- Flu Mist prescribing information at: http://www.medimmune.com/pdf/products/flumist_pi.pdf
- Influenza Vaccination of Health-Care Personnel: Recommendations of the Health Care Practices Advisory Committee (HICPAC) and the Advisory Committee on Immunization Practices (ACIP), MMWR, Feb. 24, 2006. Vol. 55/No RR-2. Available at: http://www.cdc.gov/mmwr/preview/mmwrhtml/rr5502a1.htm
- Prevention and Control of Influenza: Recommendations of the Advisory Committee on Immunization Practices (ACIP), 2008, MMWR, Early release, July 17, 2008. Vol. 57. Available at: http://www.cdc.gov/mmwr/preview/mmwrhtml/rr57e717a1.htm
- Prevention and Control of Seasonal Influenza with Vaccines: Recommendations of the Advisory Committee on Immunization Practices (ACIP), 2009, MMWR, Early release, July 24, 2009/ Vol. 58. Available at: http://www.cdc.gov/mmwr/

Important Notice about LAIV:
LAIV should be stored in a refrigerator between 2–8 degrees Centigrade (35–46°F) when received and used before the expiration date.
DO NOT FREEZE.

http://www.cdc.gov/vaccines/pubs/vis/downloads/vis-flulive.pdf

LIVE, INTRANASAL INFLUENZA VACCINE

WHAT YOU NEED TO KNOW 2009-10

Many Vaccine Information Statements are available in Spanish and other languages. See www.immunize.org/vis.

1 Why get vaccinated?

Influenza ("flu") is a contagious disease.

It is caused by the influenza virus, which can be spread by coughing, sneezing, or nasal secretions.

Other illnesses can have the same symptoms and are often mistaken for influenza. But only an illness caused by the influenza virus is really influenza.

Anyone can get influenza, but rates of infection are highest among children. For most people, it lasts only a few days. It can cause:

- fever
- sore throat
- chills
- muscle aches
- cough
- headache
- fatigue

Some people, such as infants, elderly, and those with certain health conditions, can get much sicker. Flu can cause high fever and pneumonia, and make existing medical conditions worse. It can cause diarrhea and seizures in children. On average, 226,000 people are hospitalized every year because of influenza and 36,000 die – mostly elderly. **Influenza vaccine can prevent influenza.**

2 Live, attenuated influenza vaccine - LAIV (nasal spray)

There are two types of seasonal influenza vaccine:

1. **Live, attenuated** influenza vaccine (LAIV) contains live but attenuated (weakened) influenza virus. It is sprayed into the nostrils.
2. **Inactivated** influenza vaccine, sometimes called the "flu shot," is given by injection. *Inactivated influenza vaccine is described in a separate Vaccine Information Statement.*

These "seasonal" influenza vaccines are formulated to prevent annual flu. They do not protect against pandemic H1N1 influenza.

Influenza viruses are always changing. Because of this, influenza vaccines are updated every year, and an annual vaccination is recommended.

Each year scientists try to match the viruses in the vaccine to those most likely to cause flu that year. When there is a close match the vaccine protects most people from serious influenza-related illness. But even when there is not a close match, the vaccine provides some protection. Influenza vaccine will *not* prevent "influenza-like" illnesses caused by other viruses.

It takes up to 2 weeks for protection to develop after the vaccination. Protection lasts up to a year.

LAIV does not contain thimerosal or other preservatives.

3 Who can get LAIV?

LAIV is approved for people from **2 through 49 years of age**, who are not pregnant and do not have certain health conditions (see #4, below). Influenza vaccination is recommended for people who can spread influenza to others at high risk, such as:

- **Household contacts and out-of-home caregivers** of children up to 5 years of age, and people 50 and older.
- Physicians and nurses, and family members or anyone else in **close contact with people at risk** of serious influenza.

Health care providers may also recommend a yearly influenza vaccination for:

- People who provide **essential community services**.
- People living in **dormitories, correctional facilities**, or under other crowded conditions, to prevent outbreaks.

Influenza vaccine is also recommended for anyone who wants to **reduce the likelihood of becoming ill** with influenza or **spreading influenza to others**.

4 Some people should not get LAIV

LAIV is not licensed for everyone. The following people should get the **inactivated** vaccine (flu shot) instead:

- **Adults 50 years of age and older or children between 6 months and 2 years of age**. (Children younger than 6 months should not get either influenza vaccine.)
- Children younger than 5 with asthma or one or more episodes of wheezing within the past year.
- People who have long-term health problems with:
  - heart disease
  - kidney or liver disease
  - lung disease
  - metabolic disease, such as diabetes
  - asthma
  - anemia, and other blood disorders
- Anyone with certain muscle or nerve disorders (such as seizure disorders or cerebral palsy) that can lead to breathing or swallowing problems.
- Anyone with a weakened immune system.
- Children or adolescents on long-term aspirin treatment.
- Pregnant women.

Tell your doctor if you ever had Guillain-Barré syndrome (a severe paralytic illness also called GBS). You may be able to get the vaccine, but your doctor should help you make the decision.

The **flu shot** is preferred for people (including health-care workers, and family members) in close contact with anyone who has a *severely* weakened immune system (requiring care in a protected environment, such as a bone marrow transplant unit). People in close contact with those whose immune systems are less severely weakened (including those with HIV) may get LAIV.

Anyone with a nasal condition serious enough to make breathing difficult, such as a very stuffy nose, should get the flu shot instead.

Some people should talk with a doctor before getting either influenza vaccine:

- Anyone who has ever had a serious allergic reaction to eggs or another vaccine component, or to a previous dose of influenza vaccine. *Tell your doctor if you have any severe allergies.*
- People who are moderately or severely ill should usually wait until they recover before getting flu vaccine. If you are ill, talk to your doctor or nurse about whether to reschedule the vaccination. People with a mild illness can usually get the vaccine.

5 When should I get influenza vaccine?

You can get the vaccine as soon as it is available, usually in the fall, and for as long as illness is occurring in your community. Influenza can occur any time from November through May, but it most often peaks in January or February. Getting vaccinated in December, or even later, will still be beneficial in most years

Most people need one dose of influenza vaccine each year. **Children younger than 9 years of age getting influenza vaccine for the first time** – or who got influenza vaccine for the first time last season but got only one dose – should get 2 doses, at least 4 weeks apart, to be protected.

Influenza vaccine may be given at the same time as other vaccines.

6 What are the risks from LAIV?

A vaccine, like any medicine, could possibly cause serious problems, such as severe allergic reactions. The risk of a vaccine causing serious harm, or death, is extremely small.

Live influenza vaccine viruses rarely spread from person to person. Even if they do, they are not likely to cause illness.

LAIV is made from weakened virus and does not cause influenza. The vaccine can cause mild symptoms in people who get it (see below).

Mild problems:

Some children and adolescents 2-17 years of age have reported mild reactions, including:

- runny nose, nasal congestion or cough
- fever
- headache and muscle aches
- wheezing
- abdominal pain or occasional vomiting or diarrhea

Some adults 18-49 years of age have reported:

- runny nose or nasal congestion
- sore throat
- cough, chills, tiredness/weakness
- headache

Severe problems:

- Life-threatening allergic reactions from vaccines are very rare. If they do occur, it is usually within a few minutes to a few hours after the vaccination.
- If rare reactions occur with any product, they may not be identified until thousands, or millions, of people have used it. Millions of doses of LAIV have been distributed since it was licensed, and no serious problems have been identified. Like all vaccines, LAIV will continue to be monitored for unusual or severe problems.

7 What if there is a severe reaction?

What should I look for?

Any unusual condition, such as a high fever or behavior changes. Signs of a severe allergic reaction can include difficulty breathing, hoarseness or wheezing, hives, paleness, weakness, a fast heart beat or dizziness.

What should I do?

- **Call** a doctor, or get the person to a doctor right away.
- **Tell** the doctor what happened, the date and time it happened, and when the vaccination was given.
- **Ask** your provider to report the reaction by filing a Vaccine Adverse Event Reporting System (VAERS) form. Or you can file this report through the VAERS website at www.vaers.hhs.gov, or by calling 1-800-822-7967.

VAERS does not provide medical advice.

8 The National Vaccine Injury Compensation Program

A federal program exists to help pay for the care of anyone who has a serious reaction to a vaccine.

For more information about the National Vaccine Injury Compensation Program, call **1-800-338-2382**, or visit their website at **www.hrsa.gov/vaccinecompensation**.

9 How can I learn more?

- Ask your provider. They can give you the vaccine package insert or suggest other sources of information.
- Call your local or state health department.
- Contact the Centers for Disease Control and Prevention (CDC):
  - Call **1-800-232-4636** (**1-800-CDC-INFO**) or
  - Visit CDC's website at **www.cdc.gov/flu**

DEPARTMENT OF HEALTH AND HUMAN SERVICES
CENTERS FOR DISEASE CONTROL AND PREVENTION

Vaccine Information Statement
Live, Attenuated Influenza Vaccine (8/11/09) U.S.C. §300aa-26

http://www.immunize.org/catg.d/p2027.pdf

It's federal law!

You must give your patients current Vaccine Information Statements (VISs)

As healthcare professionals understand, the risks of serious consequences following vaccination are many hundreds or thousands of times less likely than the risks associated with the diseases that the vaccines protect against. Most adverse reactions from vaccines are mild and self-limited. Serious complications are rare, but they can have a devastating effect on the recipient, family members, and the providers involved with the care of the patient. We must continue the efforts to make vaccines as safe as possible.

Equally important is the need to furnish vaccine recipients (or the parents/legal representatives of minors) with objective information on vaccine safety and the diseases that the vaccines protect against, so that they are actively involved in making decisions affecting their health or the health of their children. When people are not informed about vaccine adverse events, even common, mild events, they can lose their trust in healthcare providers and vaccines. Vaccine Information Statements (VISs) provide a standardized way to present objective information about vaccine benefits and adverse events.

What are VISs?

VISs are developed by the staff of the Centers for Disease Control and Prevention (CDC) and undergo intense scrutiny by panels of experts for accuracy. Each VIS provides information to properly inform the adult vaccine recipient or the minor child's parent or legal representative about the risks and benefits of each vaccine. VISs are not meant to replace interactions with healthcare providers, who should answer questions and address concerns that the recipient or the parent/legal representative may have.

Use of the VIS is mandatory!

Before a healthcare provider vaccinates a child or an adult with a dose of any vaccine containing diphtheria, tetanus, pertussis, measles, mumps, rubella, polio, hepatitis A, hepatitis B, *Haemophilus influenzae* type b (Hib), influenza, pneumococcal conjugate, meningococcal, rotavirus, human papillomavirus (HPV), or varicella (chickenpox) vaccine, the provider is required by the National Childhood Vaccine Injury Act (NCVIA) to provide a copy of the VIS to either the adult recipient or to the child's parent/legal representative.

VISs are also available for pneumococcal polysaccharide vaccine, as well as various vaccines used primarily for international travelers. The use of these VISs is recommended but not currently required by federal law.

An alternative VIS—the multi-vaccine VIS—is an option to providing single-vaccine VISs when administering one or more of these routine birth-through-6-month vaccines: DTaP, hepatitis B, Hib, pneumococcal (PCV), polio (IPV), or rotavirus (RV). The multi-vaccine VIS can also be used when giving combination birth-through-6-month vaccines (i.e., Pediarix, Pentacel, or Comvax) or when giving two or more routine birth-through-6-month vaccines together at other pediatric visits (e.g., 12–15 months or 4–6 years).

State or local health departments or individual providers may place the clinic name on the VISs, but any other changes must be approved by the director of CDC's National Center for Immunization and Respiratory Diseases.

What to do with VISs

Some of the legal requirements concerning the use of VISs are as follows:

1. Before an NCVIA-covered vaccine is administered to anyone (this includes adults!), you must give the patient or the parent/legal representative a copy of the most current VIS available for that vaccine. Make sure you give your patient time to read the VIS prior to the administration of the vaccine.
2. You must record in your patient's chart the date the VIS was given.
3. You must also record on the patient's chart the publication date of the VIS, which appears on the bottom of the VIS.

How to get VISs

All available VISs can be downloaded from the website of the Immunization Action Coalition at www.immunize.org/vis or from CDC's website at www.cdc.gov/vaccines/pubs/vis/default.htm. Ready-to-copy versions may also be available from your state or local health department.

Non-English language versions of VISs are not available from CDC; however, several state health departments have arranged for their translations. These versions do not require CDC approval. You can find VISs in more than 30 languages on the Immunization Action Coalition website at www.immunize.org/vis. To find VISs in alternative formats (e.g., audio, web-video), go to: www.immunize.org/vis/vis_audio.asp.

To obtain a complete set of current VISs in more than 30 languages, visit IAC's website at www.immunize.org/vis

Most current versions of VISs

As of May 2009, the most recent versions of the VISs are as follows:

DTaP/DT/DTP	5/17/07	PCV	12/9/08
hepatitis A	3/21/06	PPSV	4/16/09
hepatitis B	7/18/07	polio	1/1/00
Hib	12/16/98	rabies	1/12/06
HPV (H. papillomavirus)	2/2/07	rotavirus	8/28/08
influenza (LAIV)	7/24/08	shingles	9/11/06
influenza (TIV)	7/24/08	Td/Tdap	11/18/08
Japan. enceph.	5/11/05	typhoid	5/19/04
meningococcal	1/28/08	varicella	3/13/08
MMR	3/13/08	yellow fever	11/9/04

Multi-vaccine VIS 9/18/08
(for 6 vaccines given to infants/children: DTaP, IPV, Hib, Hep B, PCV, RV)

"We have an obligation to provide patients and/or parents with information that includes both the benefits and the risks of vaccines. This can be done with the Vaccine Information Statements that healthcare providers are required by law to provide prior to the administration of vaccines."

Walter A. Orenstein, MD, past director, National Immunization Program, CDC

Technical content reviewed by the Centers for Disease Control and Prevention, May 2009.

www.immunize.org/catg.d/p2027.pdf • Item #P2027 (5/09)

Immunization Action Coalition • 1573 Selby Ave. • St. Paul, MN 55104 • (651) 647-9009 • www.immunize.org • www.vaccineinformation.org

http://www.cdc.gov/vaccines/pubs/vis/downloads/vis-instructions.pdf

Instructions for the Use of
Vaccine Information Statements

Required Use

1. Provide Vaccine Information Statement (VIS) when vaccination is given.

As required under the National Childhood Vaccine Injury Act (42 U.S.C. §300aa-26), all health care providers in the United States who administer, to any child or adult, diphtheria, tetanus, pertussis, measles, mumps, rubella, polio, hepatitis A, hepatitis B, *Haemophilus influenzae* type b (Hib), trivalent influenza, pneumococcal conjugate, meningococcal, rotavirus, human papillomavirus (HPV), or varicella (chickenpox) vaccines shall, prior to administration of each dose of the vaccine, provide a copy to keep of the relevant current edition vaccine information materials that have been produced by the Centers for Disease Control and Prevention (CDC):

- to the parent or legal representative* of any child to whom the provider intends to administer such vaccine, and
- to any adult to whom the provider intends to administer such vaccine. (In the case of an incompetent adult, relevant VISs shall be provided to the individual's legal representative.* If the incompetent adult is living in a long-term care facility, all relevant VISs may be provided at the time of admission, or at the time of consent if later than admission, rather than prior to each immunization.)

If there is not a single VIS for a combination vaccine, use the VISs for all component vaccines.

The materials shall be supplemented with visual presentations or oral explanations, as appropriate.

*"Legal representative" is defined as a parent or other individual who is qualified under State law to consent to the immunization of a minor child or incompetent adult.

2. Record information for each VIS provided.

Health care providers shall make a notation in each patient's permanent medical record at the time vaccine information materials are provided, indicating:
(1) the edition date of the Vaccine Information Statement distributed, and
(2) the date the VIS was provided.

This recordkeeping requirement supplements the requirement of 42 U.S.C. §300aa-25 that all health care providers administering these vaccines must record in the patient's permanent medical record (or in a permanent office log):
(3) the name, address and title of the individual who administers the vaccine,
(4) the date of administration, and
(5) the vaccine manufacturer and lot number of the vaccine used.

Applicability of State Law

Health care providers should consult their legal counsel to determine additional State requirements pertaining to immunization. The Federal requirement to provide the vaccine information materials supplements any applicable State laws.

Availability of Copies

Single camera-ready copies of the vaccine information materials are available from State health departments. Copies are also available on CDC's website at www.cdc.gov/vaccines/pubs/vis.

Copies are available in English and in other languages.

Reference 42 U.S.C. §300aa-26

12/9/08

Current VIS Editions

Diphtheria, Tetanus, Pertussis (DTaP/DT): 5/17/07
Haemophilus influenzae type b: 12/16/98
Hepatitis A: 3/21/06
Hepatitis B: 7/18/07
Human Papillomavirus (HPV): 2/2/07
Inactivated Influenza: 7/24/08
Live, Intranasal Influenza: 7/24/08
Measles, Mumps, Rubella (MMR): 3/13/08
Meningococcal: 1/28/08
Pneumococcal conjugate: 12/9/08
Polio: 1/1/00
Rotavirus: 8/28/08
Tetanus, Diphtheria, (Pertussis) (Td/Tdap): 11/18/08
Varicella (chickenpox): 3/13/08
Multi-Vaccine*: 9/18/08

* This VIS is as an optional alternative when two or more routine childhood vaccines (i.e., DTaP, hepatitis B, Hib, pneumococcal, polio, or rotavirus) are administered at the same visit.

http://www.cdc.gov/flu/professionals/vaccination/pdf/Vax_Clinic_guidelines.pdf

INFLUENZA (FLU)

CDC Guidelines for Large Scale Influenza Vaccination Clinic Planning

To facilitate the most efficient and safe delivery of available vaccine via large community clinics, these recommendations and guidelines have been developed to assist with planning large-scale influenza vaccination clinics by public and private vaccination groups. Ideally, plans from private and public groups should be shared to identify best practices, avoid unnecessary overlapping of services, and maximize the effective and efficient delivery of influenza vaccinations.

This document provides general guidance to help ensure smooth operations at large-scale vaccination clinics under 8 major headings:

1. Leadership roles
2. Human resource needs
3. Vaccination clinic location
4. Clinic lay-out and specifications
5. Crowd management outside of the clinic
6. Crowd management inside of the clinic
7. Clinic security
8. Clinic advertising

Leadership Roles

- Designate local clinic leaders for overall vaccination campaign operations, and leaders for communications systems from both the public and private sectors
- Designate a clinic manager and a team leader each for supplies, logistics, medical personnel, support functions and their respective backups

Human Resource Needs

- Secure staff to fill the positions of greeters-educators, priority client screeners, registration personnel, medical screeners, form/payment collectors, clinic flow controllers, vaccination assistants, vaccination administrators, security and emergency medical personnel
- Meet the language needs of the community using multi-lingual staff
- Prepare staff members to know and execute their responsibilities and be able to correctly answer questions from clients
- Cross-train staff members, if possible, to enable flexibility in meeting needs at various stations as demands fluctuate
- Make provisions for surge capacity staffing, particularly at clinic opening time, where pre-scheduling will not be done or large numbers of unscheduled clients are anticipated
- Request surge capacity staff from out-of-area city/county agencies and health departments, local private nursing agencies, local nursing associations, local law enforcement, local medical community, health care worker and pharmacy students, volunteer groups and personnel working at the retail stores/corporations that might be used as the clinic sites
- Ensure staff well-being by scheduling times for rests and snacks in a designated area

DEPARTMENT OF HEALTH AND HUMAN SERVICES
CENTERS FOR DISEASE CONTROL AND PREVENTION
SAFER·HEALTHIER·PEOPLE™

http://www.cdc.gov/flu/professionals/vaccination/pdf/Vax_Clinic_guidelines.pdf

CDC Planning Guidelines for Large Scale Influenza Vaccination Clinic Planning
(continued from previous page)

Vaccination Clinic Location

- Seek out school gyms, churches, auditoriums, theaters or other large covered public spaces accessible to the elderly and persons with disabilities
- Ensure proximity to population centers and mass transit, ample parking, separate entry and exit doors, adequate lighting and heating, functional and accessible restrooms, and adequate space for all clinic functions such as screening, registration, vaccine storage, vaccination, and staff breaks
- Select a facility with space for reasonably large and well-delineated covered gathering areas outside and inside of the clinic

Clinic Lay-Out and Specifications

- Set up for unidirectional client flow from an external gathering area eligibility screening area (multiple stations) clinic entrance facility waiting area(s) registration/question and answer/form completion area (multiple stations) medical screening/treatment area (as needed) Medicare and other payment area (multiple stations) vaccination area (multiple stations) exit at a location distant from the entrance
- Use liberal amounts of rope, stands and signs in multiple languages, as needed, in outside waiting area(s) and inside clinic to delineate routes for clients to follow from station to station
- Provide seating for clients at each vaccination station and one or more vaccination stations with surrounding screens where over-clothed clients can discreetly bare their arms for vaccination
- Section off private area(s) where clients who experience acute adverse events after vaccination or who have medical problems can be evaluated and treated
- Ensure the presence of an onsite emergency medical kit and a designated trained physician, emergency medical technician (EMT), pharmacist, or nurse certified in basic cardiopulmonary resuscitation who can administer treatment for allergic reactions and address urgent medical problems

Crowd Management Outside of the Clinic

- Schedule staff to arrive 1 to 2 hours before clinic opening time to welcome and screen clients even if pre-scheduling is being used
- Arrange accommodations for special-needs clients (e.g., persons with disabilities, very advanced age or fragility) for expedited access into the clinic
- Direct arriving clients into several lines and use numerous signs and announcements to clarify who falls into high-risk groups
- Communicate the number of vaccine doses available at the clinic to the clients
- Instruct clients to assess their eligibility to receive vaccination by reviewing the CDC, or similar, self-screening form and vaccine information statement (VIS); provide language translation services where necessary
- Update clients on their estimated waiting times to be screened
- If vaccine supplies are limited and vaccine is being prioritized for certain groups, inform waiting clients that high-risk populations only will be served and a client numbering system will be in use. More information about ACIPís recommendations for priority groups in the setting of limited TIV vaccine can be found at: URL here.
- Schedule at least 2 screeners per line to reduce crowd size and waiting times by rapidly identifying and retaining high-risk clients and dispersing non-priority individuals
- Distribute sequentially numbered tickets, VIS or other forms in appropriate languages that permit entry into the clinic to high-risk clients only
- Provide clients who cannot be served for lack of vaccine an up-to-date listing of alternative clinics providing vaccinations

DEPARTMENT OF HEALTH AND HUMAN SERVICES
CENTERS FOR DISEASE CONTROL AND PREVENTION
SAFER·HEALTHIER·PEOPLE™

http://www.cdc.gov/flu/professionals/vaccination/pdf/Vax_Clinic_guidelines.pdf

CDC Planning Guidelines for Large Scale Influenza Vaccination Clinic Planning
(continued from previous page)

Crowd Management Inside of the Clinic

- Vaccinate clients in the order of their numbered tickets
- Arrange accommodations for special-needs clients (e.g., persons with disabilities, very advanced age or fragility) to receive expedited vaccination ñ consider a dedicated vaccination line
- Communicate clinic updates and wait times for vaccination so that clients are free to leave and return to be vaccinated
- Provide entertainment materials, TV and/or refreshments if wait times are anticipated to be long
- Assist clients in completing required forms (e.g., consent forms and/or vaccination cards) by having sufficient registration staff available
- Utilize runners to keep staff stocked with ample supplies so that they can remain at their stations
- Maintain a steady flow of clients through the clinic so that vaccinators are never without a client at their stations; redirect clients who create bottlenecks
- Fill syringes with vaccine at the time of vaccination only ñ prepare just enough vaccine to meet the clinicís ongoing needs if providers insist upon pre-filling syringes; never pre-fill before clinic opening hours
- Discard any vaccine-filled syringes remaining after the clinic closes
- Provide adequate facilities (e.g., waiting areas, restrooms, water) to meet the needs of the clients

Clinic Security

- Require all staff to wear identification cards color coded for their job functions
- Consider using uniformed presence to act as security and assist in managing crowds
- Employ security personnel to monitor the mood of waiting crowds and communicate deteriorating situations to the clinic manager
- Secure the vaccine and protect clinic staff and their valuables
- Recruit local volunteers familiar to clinic customers since they may be especially effective in diffusing crowd-related tension

Clinic Advertising

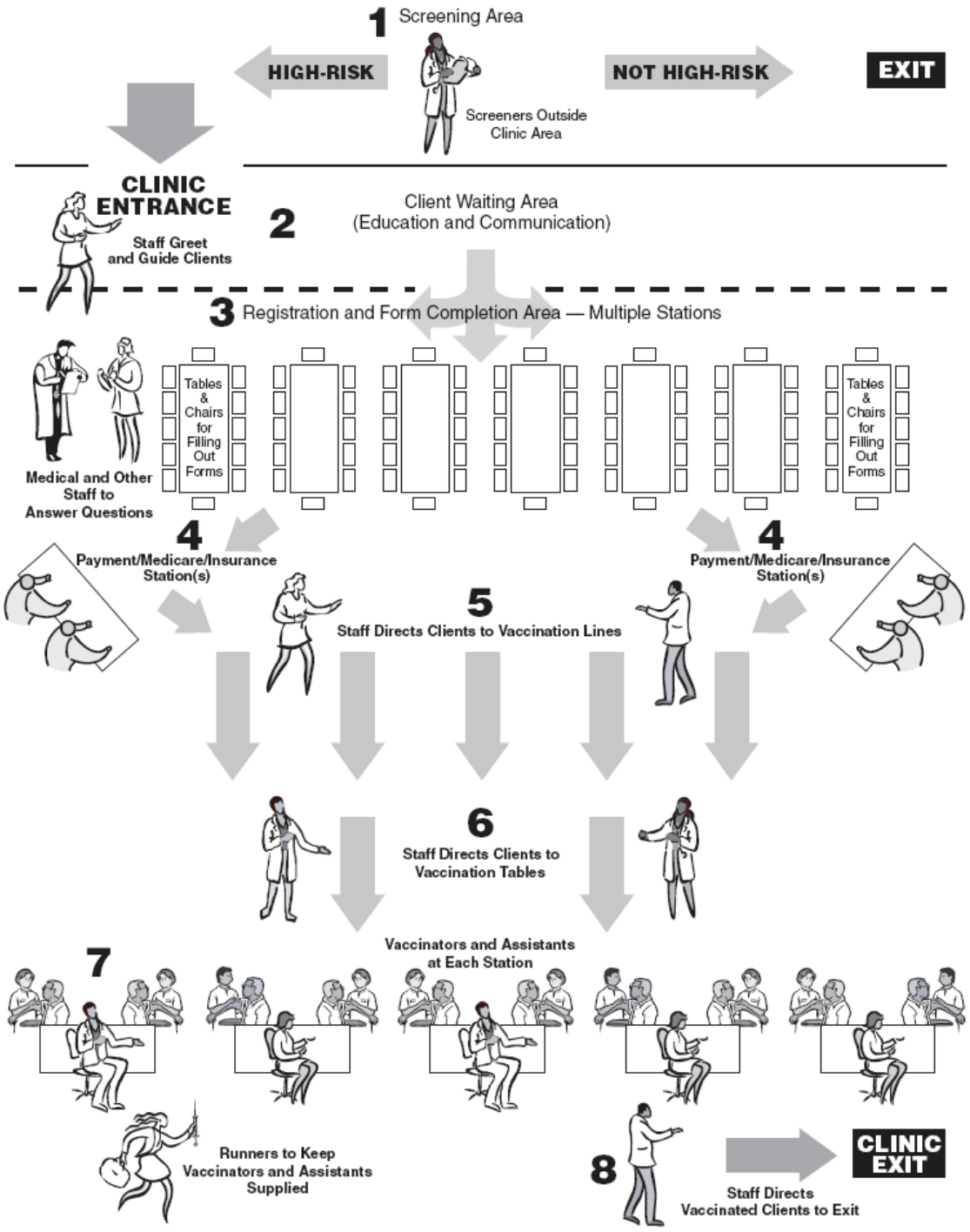
- Use multi-lingual and multimedia channels to widely post clinic purpose, dates, locations, times, and which populations will be served
- Provide instructions on how to set up appointments via telephone, in person, or other systems if pre-scheduling will be used
- Know how much vaccine is available for a scheduled clinic and how to reallocate vaccine through centralized or individual clinic efforts to meet the acute needs of other providers
- Recognize that scheduling may be overwhelmed and therefore not be maintainable or able to meet clientsí needs during a time of severe vaccine shortage; direct clients to other facilities as required

DEPARTMENT OF HEALTH AND HUMAN SERVICES
CENTERS FOR DISEASE CONTROL AND PREVENTION
SAFER·HEALTHIER·PEOPLE™

http://www.cdc.gov/flu/professionals/vaccination/pdf/Vax_Clinic_guidelines.pdf

CDC Planning Guidelines for Large Scale Influenza Vaccination Clinic Planning
(continued from previous page)

High-Volume Influenza Vaccination Clinic



DEPARTMENT OF HEALTH AND HUMAN SERVICES
CENTERS FOR DISEASE CONTROL AND PREVENTION
SAFER • HEALTHIER • PEOPLE™

CDC Planning Guidelines for Large Scale Influenza Vaccination Clinic Planning
(continued from previous page)

REFERENCES

These vaccination clinic planning considerations are a compilation of concepts and practices from many sources ñ published, unpublished and personal communication.

Published sources:

- Prevention and Control of Influenza: recommendations of the Advisory Committee on Immunization Practices (ACIP) http://www.cdc.gov/mmwr/preview/mmwrhtml/rr55e628a1.htm
- General Guidelines for Smallpox Vaccination Clinics: www.bt.cdc.gov/agent/smallpox/response-plan/files/annex-2.pdf
- Guidelines for Large Scale Vaccination Clinics: www.bt.cdc.gov/agent/smallpox/response-plan/files/annex-3.pdf
- HHS Pandemic Influenza Plan http://www.hhs.gov/pandemicflu/plan/pdf/HHSPandemicInfluenzaPlan.pdf
- Vaccination Ventures: Explanation and Outcomes of Mass Smallpox Vaccination exercises. San Francisco Department of Public Health www.dph.sf.ca.us./Reports/June17Drill/FnlJune17Rpt.pdf

Unpublished draft document sources

- Outbreak Control and Vaccination Campaign Management; Meningitis and Special Pathogens Branch, NCIS, CDC
- Community-Based Mass Prophylaxis: A Planning Guide for Public Health Preparedness. October 2004. Agency for Healthcare Research and Quality, Rockville, MD. http://www.ahrq.gov/research/cbmprophyl/cbmpro.htm
- General Guidelines for Pandemic Influenza Vaccination Clinics; Health Services Research and Evaluation Branch, NIP, CDC
- Pandemic Influenza: Clinic Preparation Checklists; Health Services Research and Evaluation Branch, NIP, CDC
- State and county health pandemic influenza preparedness plans; selected states
- State, county and city after action reports on exercises of mass prophylaxis and immunization plans; selected states

Personal Communication

- National Influenza Vaccine Summit; Community Vaccinators Working Group members Department of Health and Human Services Centers for Disease Control and Prevention

For more information, visit www.cdc.gov/flu,
or call CDC at 800-CDC-INFO (English and Spanish) or 888-232-6348 (TTY).

Section II

How to Improve Vaccination Rates in VHA Employees, Trainees, and Volunteers

How to Improve Vaccination Rates in VHA Employees, Trainees, and Volunteers

VHA employees, trainees, and volunteers are at an increased risk of acquiring influenza because they are exposed to hospitalized patients and clinic patients who have influenza as well as to infected individuals in the community.

Whether infected in the community or on the job, VA employees, trainees, and volunteers who are infected with influenza can further transmit the virus.

CDC recommends that all health care workers receive an annual influenza vaccination to prevent transmission to patients. The goals of this strategy are to reduce the risk of patient influenza exposure and to ensure that provision of services is not disrupted. Influenza vaccination rates among health care workers remains low, with only 36–40 percent of health care workers nationwide reporting influenza vaccination each year (Source: Simeonsson K, Summers-Bean C, Connolly A., Influenza vaccination of health care workers: institutional strategies for improving rates, N C Med J. 2004 Nov-Dec;65(6):323-9.).

Why Employees, Volunteers and Others Who Work in VHA Should Be Vaccinated Against Seasonal Influenza

Transmission of influenza in health care settings is a major concern. Health care professionals (all paid and unpaid persons working in health care settings who have the potential for exposure to infectious materials), who acquire influenza can spread the infection to patients, coworkers and their families and friends. Vaccination against influenza is an effective way to prevent influenza and its potential complications. In educating employees on why they should be vaccinated, staff should stress:

- The vaccine is effective in preventing seasonal influenza.
- Transmission to patients, coworkers, family members, and friends is minimized when health care workers are vaccinated.
- Individuals infected with the influenza virus may infect others as they shed the influenza virus at least one day before any symptoms occur and continue until 4 to 5 days after symptoms begin.
- Absenteeism due to influenza decreases the number of staff available to take care of patients which many see as a patient safety issue as it affects the delivery of care.

VHA's Performance in Vaccinating Employees, Volunteers, and Other Health Care Workers

VHA established a performance monitor for vaccinating employees against seasonal influenza. Graph 1 illustrates VISN performance over the last 4 years. In FY09, 64% of VHA employees were vaccinated against seasonal influenza.

Influenza vaccination remains an important patient safety issue because unvaccinated employees, trainees, and volunteers can transmit influenza to patients, coworkers, and family members, leading to influenza-related illness and death.

In FY 2009, 64% of VHA employees were vaccinated against seasonal influenza

VHA Performance Monitor FY10: Employee Vaccination Rate

FY 2010 Employee Vaccination Goals:

70% employee vaccination rate to **meet** the performance monitor

75% employee vaccination rate to **exceed** the performance monitor

Employees, trainees, and volunteers should understand that personal responsibility includes protecting themselves against infectious disease such as influenza and thus protecting their patients. When promoting vaccination among employees, trainees, and volunteers, emphasize the reasons to get the influenza vaccine:

- Protects patients
- Protects families
- Protects you and your coworkers
- Decreases need to use sick leave
- Prevents severe illness
- Prevents death

Obstacles—Individual Beliefs

Vaccine acceptance may vary by communities, occupational groups, and demographics. Understanding immunization patterns and demographics of employees, volunteers and others who work in VHA can guide the development of strategies to improve vaccine acceptance.

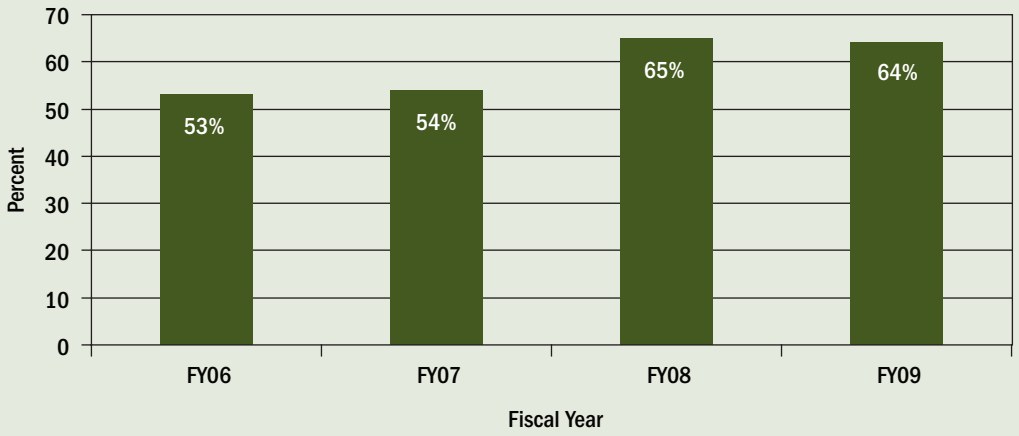
Reasons staff may accept seasonal influenza vaccination include:

- Desire to protect patients
- Desire to protect themselves
- Desire to protect family and friends
- Desire to avoid missing work
- Previous seasonal influenza vaccination
- Perceived effectiveness of the vaccine
- Previous illness due to influenza
- Strong recommendation from leadership and peers
- Personal physician recommendation

Reasons staff may decide not to get vaccinated against seasonal influenza include:

- Fear of getting seasonal influenza from the vaccine
- Fear of vaccine side effects
- Fear of needles
- Perception that they are at low risk of getting seasonal influenza

Graph 1: VHA Employees Vaccinated Against Seasonal Influenza FY06–FY09



Note: Data represents only those facilities within each VISN that reported the number of employees vaccinated.

- Belief that the vaccine is not effective in preventing influenza
- Belief that seasonal influenza is not a serious disease
- Inconvenience in obtaining the vaccine
- Ignorance of CDC and other expert recommendations for vaccination

Therefore, there should be continuous and ongoing vaccine education updates emphasizing the seriousness of influenza and addressing misconceptions about influenza and the vaccine. Facilities should determine why staff at their facility elect not to get vaccinated and develop strategies which address those concerns. Targeted messages which address common misconceptions must be addressed such as, "The flu vaccine does NOT give you influenza." "Influenza is the sixth leading cause of death in adults in the United States." Or "There is evidence that vaccinating health care workers reduces mortality among patients in long term care facilities."

Messages

Examples of messages that might be used include:

"You know that the influenza vaccine works, so why don't more people get vaccinated?"
Some people are concerned about side effects. They think that the influenza vaccine will make them sick. However, mild soreness of the arm at the injection site is the most common side effect. The vaccine itself will NOT give you influenza. Influenza vaccination is the best protection against influenza. Protect VA patients, yourself, your co-workers and your family. Get vaccinated. Check with Occupational Health for information on how to get your influenza vaccine.

"Why should employees, trainees, and volunteers be vaccinated against influenza?"
There are several reasons why employees, trainees, and volunteers should be vaccinated against influenza every year:

- They can get the influenza virus from their patients resulting in absence from their positions.
- They can acquire influenza infection and not have any symptoms, but still be able to transmit the disease.
- Employees, trainees, and volunteers who are ill with influenza often continue to work and spread the virus to other employees, volunteers, patients, and family members.
- Unvaccinated employees, trainees, and volunteers have caused influenza outbreaks in health care settings.

"Did you get your influenza vaccine last year?"
If you didn't, you may have harmed the health of some of our patients, your co-workers, and family members. You can spread influenza to patients, putting them at risk for influenza and its complications. Studies show that vaccination of health care workers is associated with decreased mortality among Community Living Center residents. Protect yourself and our Veterans; get a flu shot. Ask Occupational Health about when and where to receive your vaccination.

"I'm healthy. I don't need to get vaccinated for flu." Is this you?
Influenza can cause serious illness and death even in young, healthy people. It's not just a disease that affects the elderly. If you get influenza, you can spread it to your patients, putting them at risk for severe illness and complications from the influenza virus. Protect yourself, your co-workers, and your patients—get vaccinated for flu. Ask Occupational Health about when and where to receive your vaccination.

"The residents in long-term care need the influenza vaccine more than I do."
Wrong. Studies, especially in long-term care, have shown that it is as important for health care workers to receive the vaccine as it is for residents.

"I don't want to get the vaccine because it has side effects."
Studies have shown that the influenza vaccine is not associated with higher rates of systemic symptoms than are seen with injections of placebos among healthy working adults. The most common side effects of influenza vaccination include: soreness, redness, or swelling at the injection site, mild or low-grade fever, and aches. The symptoms should only last a day or two. The most common side effects from the nasal influenza vaccine are a runny nose and nasal congestion.

"I got the influenza vaccine before and I still got influenza, so why should I get it now?"
In years when there is a good match between the circulating viruses and the corresponding vaccine strains, vaccine efficacy for reducing illness has generally been between 70–90 percent. However, even when the viruses are not well matched, the vaccine can protect many people and prevent flu-related complications.

"I'm pregnant. Should I get the influenza vaccination?"
Yes. All pregnant women are at risk from influenza and its complications. It is important that pregnant employees, trainees, and volunteers get the influenza vaccine to protect themselves and their babies. The influenza vaccine can be given any time during the pregnancy. However, pregnant women should NOT receive the nasal influenza vaccine.

"I don't like needles, so I don't want to get vaccinated."
Check with Occupational Health. You may be a candidate for the nasal spray, LAIV. This is an option for healthy employees, trainees, and volunteers up through age 49, especially when there is a shortage of inactivated influenza vaccine.

"I don't need the vaccine. If I get the flu, I'll just take an antiviral medication."
Antiviral medications do not eliminate flu symptoms. They do shorten the duration by about 3 days, so you will need to be off work. Like all medication, antivirals may have side effects. It's better to get the flu vaccine.

"I'm not in a high risk group."
You may also be at a high risk if you are over the age of 50 or have a chronic health problem such as diabetes. Even if you are not at high risk, the Veterans you care for and members of your family may be. To protect them, you should get the flu vaccine.

"My health care provider didn't recommend it to me."
The CDC recommends that all individuals who work in a health care setting get vaccinated annually.

"I always get 'the flu' when I take the vaccine."
When you are vaccinated, you may develop a temporary mild interferon response. This is a healthy normal response that may result in some mild discomfort, but this is different from actually getting influenza.

"My immune system is working just fine, thank you" or "I never get the flu."
Remember, you can transmit influenza to others before you become symptomatic. Asymptomatic carriage occurs for 24 hours prior to symptom development. To protect your patients and family, you should get vaccinated.

12 Tips on How to Increase Influenza Vaccination Rates in Employees, Trainees, and Volunteers

1. Identify a facility champion whose main responsibility is getting employees vaccinated against influenza.
2. Encourage top management to be active members of the influenza vaccination program.
3. Enlist peer vaccination champions to encourage influenza vaccination.
4. Sponsor a kickoff event.
5. Set vaccination rate goals and set up competition among departments/services/units.
6. Make the vaccine accessible by increasing occupational health clinic hours, increasing the locations where vaccination is available, and taking the vaccine to employees, trainees, and volunteers via mobile carts.
7. Advertise the dates, times, and locations of influenza vaccination in multiple message formats.
8. Provide training or educational materials on why it is important for employees, trainees, and volunteers to get vaccinated.
9. Keep track of who is vaccinated so that targeted reminders can be sent to those who do not get vaccinated.
10. Identify why individuals do not wish to get the influenza vaccine and develop targeted messages to address those concerns.
11. Send postcards or e-mails to asking staff to inform occupational health if they were vaccinated somewhere else.
12. Track and report, on a daily basis, the number of employees, volunteers, and others who are vaccinated.

"There are so many strains of flu that the vaccine can't cover them all."

The World Health Organization (WHO) and Centers for Disease Control and Prevention (CDC) carefully select the H1N1, H2N3 and B component strains of the vaccine at the outset of each seasonal influenza season. Your immunogenic response for those identified strains helps provide more general protection during the winter months when influenza is more common. Although the vaccine may not exactly match the circulating influenza viral strains, if exposed to influenza, your symptoms will be milder than if you had not been vaccinated.

Strategies for Increasing Employee, Trainees and Volunteer Influenza Vaccination Rates

Use a Team Approach

Organizing an employee vaccination campaign does not need to be complicated. The educational component of the program may take more planning than other aspects of the campaign. Forming an interdisciplinary team to plan and oversee the campaign to immunize health care workers against seasonal influenza is an approach that other hospitals have found useful. Members of the team might include: management, a facility champion, occupational health, infection control, infectious disease, hospital epidemiologist, pharmacy, and public relations. The

team meets before the start of the influenza season to plan strategies, meets periodically during the season to make revisions to their plan and at the end of the season to identify any lessons learned. The team may also identify a "theme" which may change from year to year or sponsor a campaign slogan contest to raise awareness and increase interest. Health care organizations have found that having someone in charge of the staff influenza vaccination program is essential to be successful over time.

Consider Timing of Vaccination

The goal of VHA's seasonal influenza vaccination program is to vaccinate as many employees, volunteers and others as possible, preferably before influenza activity in the community begins. Occupational Health staff should offer the vaccine as soon as the vaccine becomes available. This is especially true this fall since there may be a novel H1N1 vaccine. The seasonal influenza vaccine should be offered throughout the influenza season which often extends through spring.

Maintaining effort is an issue. Facilities have found it useful to have a kick off event, remind staff to get vaccinated during the "National Influenza Vaccination Week" and to have a third effort in January which includes capturing those who may have been vaccinated elsewhere. During these periods, staff may find it useful to sponsor podcasts, e-cards, and other electronic means to remind staff that the vaccine is available. In addition, facilities may consider providing vaccination at the same time as another required activity such as mandatory training and tuberculosis screening activities.

Use Organizational Approaches

- Make influenza vaccination of employees, trainees, and volunteers an organizational priority.
- Encourage the facility director, service chiefs, and other managers to lead the way by getting their vaccine and encouraging their employees, trainees, and volunteers to get vaccinated.
- Provide written policy stressing importance of vaccination for employees, trainees, and volunteers with clear direction from leadership (i.e., Directive, letter from Facility Director to all employees, trainees, and volunteers, or Flu Advisory).
- Customize information for local distribution with local leadership buy-in and involvement. Use photos of hospital directors or other opinion leaders getting their influenza vaccine (newsletters, posters, TV/monitor displays).
- Enlist peer vaccination champions to encourage employee and volunteer vaccinations.
- Sponsor a kickoff event at the start of influenza season. Think about a theme for the event. For maximum exposure, hold the event in a high-traffic area. Arrange for the hospital Director and a union representative to provide opening remarks and get their vaccine.
- Hold an event during National Influenza Vaccination Week (Dec. 8–14, 2008).
- Publicize the campaign activities often.
- Provide performance feedback:
  - Set goals/benchmarks, encourage friendly competition among employees, trainees, and volunteers in different clinical settings, provide incentives to employees, trainees, and volunteers who receive vaccine through worksite or private source.
  - Consider giving incentives such as buttons, stickers, canteen vouchers, movie passes, or raffle tickets for specific items.

- Thank everyone who contributed to the flu campaign efforts, and especially to employees who committed to keeping themselves, their patients, and families healthy by getting vaccinated. Send out congratulations to departments/services that achieved the highest vaccination numbers/rates.

Employ Systems Strategies

- Provide standing orders/protocols for influenza vaccine.
- Work closely with Pharmacy to get your supply of vaccine for employees, trainees, and volunteers and work closely on timing of vaccination clinics.
- Develop ways to monitor vaccination rates and provide feedback to specific clinics or settings.

An example of limitations and strategies to improve vaccination rates among employees, trainees, and volunteers.

Limitations	Specific Limitation	Strategies to Improve
1. Resources:	Lack of vaccine available	Vaccine made available for staff vaccination earlier in vaccination season Kickoff event planned for after first vaccine delivery so would not run out and have to stop campaign
	Lack of staff for documenting	Utilized nurses on transitional duty to input data
	Lack of staff to vaccinate employees during kickoff event	Nursing students supplemented staffing at kickoff event Additional RN assigned to mobile cart during first month of vaccination season
2. Access	Limited hours offering vaccination	Vaccine made available to staff 24/7
	Vaccine not available at convenient location	Mobile carts used to bring vaccine to all areas several times during vaccination season
3. Documentation and tracking	Improper data entry	Training and e-mail reminders about proper way to record vaccination of employees in CPRS
	Inability to identify who received vaccine outside of occupational health	Utilized postcards to capture data on employees and volunteers vaccinated elsewhere; distributed postcards to supervisors to give to employees, employees instructed where to drop off postcards (at secure locations)
4. Marketing	Lack of advertising about vaccine availability and where could get vaccinated	E-mail advertising of kickoff event Posters in lobby and cafeteria advertising kickoff event
5. Education	Employees are overheard repeating myths	Send regular messages with accurate information Make informational posters and brochures available

- Consider utilizing FluMist® (nasal or LAIV), as an alternative to influenza shots, for employees, trainees, and volunteers under age 50 who do not routinely come in close contact with severely immunocompromised patients and have no contradiction.
- Be sure documentation of receipt of vaccination gets into the employee's medical record.

Make It Convenient

- Extend Occupational Health hours when vaccine is available to include all shifts and days of the week.
- Increase staffing in Occupational Health during peak hours. Consider using volunteers to sign employees in and nurses with work related injuries to administer the vaccine if it is within their functional abilities. (Check with the workers' compensation specialist and nursing service for who might be able to assist.) Consider utilizing nursing students to augment staff vaccinating employees.
- Increase the number of locations where the vaccine is given. Hold drop-in vaccination days, or "drive-through" vaccination clinics for employees, trainees, and volunteers.
- Use rolling carts to bring the influenza vaccine directly to the work setting, grand rounds, canteen entrance, and other locations where employees, trainees, and volunteers congregate. Sending rolling carts to wards and clinics during each shift and on weekends should also be considered. Carts should be stocked with vaccine, safety syringes, vaccine information statements, sharps disposal containers, alcohol hand rub, alcohol wipes, adhesive bandages, documentation forms, and injectable epinephrine with orders for administration in the event of an acute hypersensitivity reaction.
- Send e-mail messages and post schedules of when the influenza vaccine will be available.
- Authorize nurses on units to give the influenza vaccine to coworkers.
- Allow employees to take the vaccine during veteran flu vaccine drives.
- Announce the availability of the vaccine via audible paging systems as available.
- Offer the vaccine to new employees, trainees, and volunteers during orientation.

Communicate, Remind, and Reinforce

- Use multiple message formats, repeat announcements regarding dates, times, and locations of vaccination:
  - Provider e-mail, newsletters, posters, buttons, pens, cafeteria table tents
  - Paycheck stubs, Web site messages
- Post schedules ahead of time for mobile carts and influenza clinics.
- Work with your unions' leadership; have them promote vaccination of their members and recruit union members who are licensed to vaccinate to immunize their membership.
- Make appointments with departments and services to attend service meetings to educate employees, trainees, and volunteers about the need to protect employees, volunteers, and patients from influenza.
- If your occupational health unit has a Web site, add information to the Web site regarding influenza vaccination locations and times for employee and volunteer vaccination.
- Send letters, postcards, or e-mail messages to employees, trainees, and volunteers prior to the start of the vaccine season reminding them of the importance of vaccination and where and when they will be able to get the influenza vaccine.

Key Elements of a Successful Employee, Trainee, and Volunteer Influenza Vaccination Campaign

1. Informing employees, trainees, and volunteers about the free availability of the vaccine and the goals of the campaign (awareness).
2. Educating employees, trainees and volunteers about its importance (marketing).
3. Making the vaccine convenient (access).
4. Notifying employees, trainees and volunteers regarding the scheduling of administration (awareness).
5. Keeping track of who has been vaccinated (feedback/evaluation).

- Write short items for the employee newsletter or post information on staff bulletin boards.
- Provide factsheets with pay stubs to dispel misconceptions and increase acceptance of influenza vaccination.
- Add an influenza reminder to Occupational Health's telephone recording. When employees, trainees, and volunteers call, they can automatically be reminded about the availability of the vaccine. If the recording capacity exists, add specific information regarding dates, times, and locations for influenza vaccination as well as any other pertinent information. These reminders can begin in September and conclude after the influenza season has peaked, which usually occurs in February or March.
- Create a computer "pop-up" message asking employees if they have received the vaccine, wish to receive the vaccine or received the vaccine elsewhere. This data can be collected, collated and employees contacted to verify and document they were vaccinated elsewhere or contact them to find a time which is convenient for them to be vaccinated. This "pop-up" message could be sent out near the beginning of the influenza season to all employees, and during the mid and late influenza vaccination season to those who have not indicated they were vaccinated.
- In late November/December or later in the season, identify employees, trainees, and volunteers not yet vaccinated and remind them by e-mail or a phone call that the influenza vaccine is available.
- Keep facility leadership (Directors, Service Chiefs) informed on vaccination rates of their employees, trainees, and volunteers on a monthly basis. Provide information of rates by wards, units, services etc.
- Create competition among services/product lines/units. Design a poster of a large syringe that can be used as an indicator of the number of individuals who have been vaccinated.
- Send out notices on which departments/services are leading the way in the percent of employees vaccinated.
- Send out daily or weekly bulletins to highlight the importance of getting vaccinated. Some examples include:
  - If you are allergic to eggs you cannot get the flu vaccine.
  - How is the flu spread? By coughing and sneezing—avoid the flu—get vaccinated.
  - Always, practice good hand washing and respiratory etiquette.
  - Did you know that in the United States, about 5% to 20% of the population becomes infected with the influenza virus annually? Avoid the Flu. Get vaccinated.

- Approximately 36,000 Americans die each year from the flu—get vaccinated.
- No one likes getting the flu—achy fever, cough, sore throat—get vaccinated.
- Be a flu buster, get vaccinated, and stop the spread of influenza.
- If you have chronic pulmonary (including asthma), cardiovascular (except hypertension), renal, hepatic, hematological or metabolic disorder (including diabetes) it is recommended that you get vaccinated.
- If you care for someone at home with a medical condition that puts them at higher risk for severe complications from influenza, protect them, get vaccinated.
- If you are over 50 years old, it is recommended that you get vaccinated.
- Ask Occupational Health for information on where and when to receive your influenza vaccine.

Educate

- Provide training on importance and effectiveness of influenza vaccination (grand rounds, staff meetings). Speak at staff meetings.
- Provide VHA Influenza Vaccine videos for display on CCTV, desktops, and at staff meetings.
- Add to standard curricula of annual staff training session.
- Emphasize the high risk to patients when employees, trainees, and volunteers are not vaccinated.
- Emphasize the low risk of side effects from the vaccine.
- Send a letter, postcard, or e-mail to employees, trainees, and volunteers prior to the start of the vaccine season reminding them of the importance of vaccination, where and when they will be able to get the influenza vaccine.
- Put an article in the employee newsletter or post information on staff bulletin boards.
- Include training regarding the importance of getting a flu shot during new employee orientation.

Additional Measures to Prevent the Spread of Influenza

Remind employees, trainees, and volunteers that although the influenza vaccination may be the best way to protect against influenza, there are other measures they should also take to protect themselves, their families, and patients. Here are some messages to use:

- Stay at home when you are sick, especially if running a fever. Not only can employees, trainees, and volunteers with influenza transmit it to others, but studies have shown that people with influenza who return to work before fully recovered have less than optimal work performance.
- Keep tissues at your desks and exercise proper respiratory hygiene.
- Dispose of used tissues properly.
- Frequently wipe down keyboards, mice, and phones with antimicrobial wipes.
- Clean your hands or wipe with hand sanitizer frequently, especially after using copy machines, fax machines, someone else's computer or phone; after sneezing, or making contact with their own secretions.
- Avoid contact with sick persons, except of course the patients you are here to help.
- Use proper personal protective equipment (PPE) and work practices when caring for ill patients.
- Clean hands before eating food.
- Clean hands frequently with water and soap or alcohol-based rubs.

Other Reasons to Be Vaccinated

Remember employees, trainees, and volunteers may also have health problems and conditions that put them at increased risk of complications from influenza. These include:

- Chronic cardiac or pulmonary disorders severe enough to require regular medical follow-up care.
- Being 50 and older.
- Chronic health conditions such as diabetes mellitus and other metabolic diseases, cancer, immunodeficiency, renal disease, anemia, and hemoglobinopathy.
- Any conditions that can compromise respiratory function or the handling of respiratory secretions or that can increase the risk of aspiration.
- Being pregnant.

Vaccination is the primary method to prevent influenza, limit transmission, and prevent complications from influenza.

Influenza vaccine may be administered to all categories of employees, trainees, and volunteers unless there is a contraindication for the vaccine. In some cases, live attenuated influenza vaccine (LAIV or FluMist®) may be administered to employees, trainees, and volunteers. It is a good option for those employees, trainees, and volunteers who are in good health, are not pregnant, have a dislike of needles, and meet the criteria for LAIV (see LAIV in Section I).

Frequently Asked Questions on Influenza Vaccination for Occupational Health

Should we vaccinate volunteers as part of our campaign?

Yes. Volunteers provide a vital service to our Veterans including the provision of direct patient care. Facilities should offer the influenza vaccine to volunteers.

Should we offer the influenza vaccine to medical residents and other trainees who provide services at the VA during the influenza season through our Occupational Health Department?

The decision with regard to resident and other trainees is an individual VA facility decision; it should take into account the contractual agreement with academic affiliates, the availability of the vaccine, and the potential benefit to the VA. Facilities may want to make the same decisions about providing the influenza vaccine for rotating or temporary trainees (e.g., house staff/medical residents) as they do for volunteers.

Should employees, trainees, and volunteers who have contact with HIV/AIDS patients and other patients with compromised immune systems be vaccinated?

All employees, trainees, and volunteers in health care settings should receive annual influenza vaccination unless they have a contraindication to the vaccine.

What are the recommendations for vaccination of employees, trainees, and volunteers against influenza?

All employees, trainees, and volunteers in health care settings should receive annual influenza vaccination unless they have a medical contraindication to the vaccine.

Why is vaccination recommended for employees, trainees, and volunteers?

- They can give influenza to patients, coworkers, family members, and others.
- They are at risk of getting influenza from patients with influenza.
- Preventing influenza through annual vaccination keeps employees, trainees, and volunteers healthy and available to come to work or to take care of patients.

Inactivated influenza vaccine (the flu shot) is the preferred vaccine for people coming into close contact with anyone who has a severely weakened immune system.

What are the recommendations for use of a declination form for employees, trainees, and volunteers against influenza?

VHA **does not** have a national mandate requiring the use of declination forms.

How do I report an adverse reaction from flu vaccination?

Providers report the adverse event through the Adverse Event Tracking Package (ART) in CPRS and also through the VA Adverse Drug Event System (VA ADERS). Providers have direct access to CPRS. The Chief of Pharmacy (or designee) at every facility inputs adverse reactions into VA ADERS for drugs and vaccines. A Vaccine Adverse Event Reporting System (VAERS) form for all vaccines should be submitted anytime an adverse event occurs. Occupational health should also use this reporting structure. The VAERS form is available at http://vaers.hhs.gov/pdf/vaers_form.pdf. On-line reporting is available at https://secure.vaers.org/

Is LAIV an option for employees, trainees, and volunteers?

Yes, LAIV is an option for healthy employees, trainees, and volunteers up through age 49, especially when there is a shortage of inactivated influenza vaccine. Choosing LAIV, currently available as FluMist®, means you are helping to conserve when there is limited inactivated influenza vaccine for high-risk persons who do not have the option of live attenuated influenza vaccine. It is also a good option for employees, trainees, and volunteers who may not get the vaccine because they are afraid of needles.

Is shedding the virus a problem for employees, trainees, and volunteers?

The FluMist® package insert states that a person can shed the virus for up to three weeks because that is what the studies in humans showed, but shedding alone should not be equated with person-to-person transmission. In fact, studies have found that person-to-person transmission caused by shedding is very rare. In a study conducted in a Finnish day care center that was designed to maximize the chance of detecting vaccine virus transmission, one child shed the virus for 21 days. Other children in this study shed the virus a mean of 7.6 days. Estimated transmission rates were extremely low (0.6–2.4 percent). There was actually only one documented case of LAIV transmission. An additional small study of 40 adults conducted since licensure found that only 50 percent of the adults were shedding the vaccine influenza virus on day three after vaccination; one adult shed the virus on day seven. That means that half the adults had stopped shedding the virus by day three. These post licensure studies prompted the Advisory Committee on Immunization Practices (ACIP), an independent committee that advises the CDC, to reduce the recommended number of days an employee or volunteer should avoid contact with patients requiring protective isolation from three weeks to seven days.

Should employees, trainees, or volunteers who have a contraindication to LAIV administer it?

They can. Environmental contamination with LAIV during administration is probably unavoidable. However, because it is an attenuated virus (weakened) that is designed not to replicate at the warm temperatures of the lower respiratory tract, the ACIP does not believe that administration of LAIV by a person with one of the contraindications to it (like asthma, chronic obstructive pulmonary disease, etc.) puts that person at risk from infection or illness from the vaccine virus.

Sample Postcard for Employees, Trainees, and Volunteers to Complete and Return to Occupational Health

Name: _____

Service: _____

Please check one:

☐ I am an employee/veteran and have had the flu shot as a veteran at the VAMC on _____. *(date)*

☐ I am a volunteer/veteran and have had the flu shot as a veteran at the VAMC on _____. *(date)*

☐ I am a volunteer and have had the flu shot outside the VAMC on _____. *(date)*

☐ I am an employee and have had the flu shot outside the VAMC on _____. *(date)*

Please place this postcard in the Occupational Health flu shot drop box located in the lobby or bring to Occupational Health

Tracking Employees, Trainees, Volunteers and Other Workers' Receipt of Vaccine

A key part of the VA seasonal influenza vaccination campaign is for facilities to develop systems to track vaccination rates among employees, trainees, and volunteers and provide feedback during the influenza vaccination campaign, which enables facilities to better manage information and in turn, increase vaccination rates and improve patient safety. Occupational Health must track who has received the vaccine so they can send messages to those who have not been vaccinated reminding of the vaccine's availability; and to report to Central Office at the end of the season the number of employees, volunteers, and other personnel who have been vaccinated.

It is beneficial for facilities to identify why staff, in general, elect not to receive the influenza vaccine. This can be accomplished through focus groups, anonymous surveys, or a review of the literature. This will enable facilities to develop focused educational programs and vaccination strategies to increase vaccination rates.

Joint Commission: Infection Control Requirements for Offering Influenza Vaccination to Staff and Licensed Independent Practitioners

The Joint Commission approved an infection control standard that requires organizations to offer influenza vaccination to staff and licensed independent practitioners, applicable to critical access hospitals, hospitals, and long-term care. This standard conforms

to recommendations made by the Centers for Disease Control and Prevention.

The Standard states:

The organization offers vaccination against influenza to licensed independent practitioners and staff.

Elements of Performance for IC.02.04.01 include:

1. The organization establishes an annual influenza vaccination program that is offered to licensed independent practitioners and staff. Note: Some jurisdictions mandate that organizations limit access to residents by health care workers who declined influenza vaccination.
2. The organization provides influenza vaccination at sites accessible to licensed independent practitioners and staff.
3. The organization educates licensed independent practitioners and staff about, at a minimum, the influenza vaccine; non-vaccine control and prevention measures and the diagnosis, spread, and impact of influenza.
4. The organization annually evaluates vaccination rates and the reasons given for not accepting the influenza vaccination.
5. The organization takes steps to increase influenza vaccination rates among staff and licensed independent practitioners.

Staff Influenza Vaccination Program Review and Planning

- Continuous quality improvement is an essential component of any program to ensure that the program meets requirements and expectations. The Joint Commission, Association for Professionals in Infection Control and Epidemiology (APIC), Health Care Infection Control Practices Advisory Committee (HICPAC), Centers for Disease Control and Prevention (CDC), and Society for Health Care Epidemiology of America (SHEA) note that measuring influenza vaccination rates is an important component of an organization's influenza vaccination program. A recent publication of The Joint Commission "Providing a Safer Environment for Health Care Personnel and Patients Through Influenza Vaccination: Strategies from Research and Practice," addresses practices that have been implemented in varied health care settings to improve seasonal flu vaccination rates among employees, http://www.jointcommission.org/NR/rdonlyres/814E02F2-1E1C-4D76-9043-DBB3E12A205A/0/Flu_Monograph.pdf

Quality improvement activities should be oriented toward the actual delivery of services and meeting the goals of VHA's program. Periodic reviews can identify strengths and areas for improvement. Occupational Health staff then can develop plans to adjust and carry out needed changes and re-evaluate the changes made to the program. In addition, it is beneficial to evaluate the vaccination program at the end of the vaccination period and identify overall program strengths and areas for improvement for the next year. Areas that should be evaluated include:

- Resources
- Access
- Documentation and Tracking
- Marketing
- Education

Sample Letter to Employees, Trainees, and Volunteers from Facility Director

[Date]

VA Employees, Trainees, and Volunteers:

Seasonal influenza is a viral infection that causes more than 226,000 Americans to be hospitalized each year. In addition, it results in approximately 36,000 deaths each year in the United States. The Centers for Disease Control and Prevention (CDC) recommends that all employees, trainees, and volunteers get the influenza vaccine annually. The National Health Interview Survey of 2003 showed that only about 40 percent of health care workers received the influenza vaccination. Last year, 64% of VHA employees were vaccinated, but VA is capable of improving on these results and obtaining our goal of a vaccination rate of 80% by 2011.

By immunizing yourself against influenza, you protect yourself, your family, and the Veterans to whom you provide care. Unvaccinated employees, trainees, and volunteers may transmit influenza in health care settings. They can spread the virus because they often work while ill or just before they become ill. Vaccination of employees, trainees, and volunteers has been proven to decrease the transmission of influenza and the rate of influenza-related complications such as pneumonia, which may cause complications and death for employees, volunteers, and the Veterans they care for.

If every staff member would be vaccinated against influenza every year, we could really make a difference on the burden of this disease in VHA.

Protect yourself, protect your family, AND protect the Veterans who served our country. Get vaccinated for seasonal influenza and encourage other employees, trainees, and volunteers to do the same.

Sincerely,

_____

Facility Director

Section III

Best Strategies for Increasing Veteran Influenza Vaccination Rates

Best Strategies for Increasing Veteran Influenza Vaccination Rates

The following strategies have been shown to be effective for increasing Veteran influenza vaccination rates. They are most effective when used in conjunction with each other. Employee, trainee, and volunteer strategies are described in Section II.

Getting Veteran Patients Vaccinated

1. Use Organizational Approaches

BEFORE your vaccination campaign begins

- Make influenza vaccination an organizational priority.
- Develop and provide written policy stressing importance and effectiveness of patient influenza vaccination with clear direction from VHA leadership (i.e., Directive, Flu Advisory or Medical Center Policy).
- Establish an influenza vaccination campaign committee, with diverse clinical and support membership. Schedule meetings prior to and during the vaccination season. Discuss successful strategies and what needs improvement.
- Set goals/benchmarks, based on previous year's performance and current year's targets from the national seasonal influenza vaccination campaign, found in the VA Influenza Manual.
- Coordinate planned activities to coincide with the seasonal influenza vaccine delivery schedule.
- Develop a month-by-month calendar of activities to prepare for a vaccination campaign.
- Solicit local leadership buy-in and involvement.
  - Use photos of hospital director or other opinion leaders getting their influenza vaccine in newsletters and VA TV/monitor displays.
- For each ward, clinic, domiciliary, Community Living Center and CBOC, recruit a Flu Vaccination Champion who will lead efforts and keep the momentum flowing in their area.
- Customize information for local distribution (e.g., bulletins, announcements, e-mail messages).

DURING your vaccination campaign

- Using performance feedback:
  - Monitor/assess the number and percent of high-risk patients vaccinated, and the number of female patients vaccinated.
  - Inform providers and teams re: the number and percent of high-risk patients vaccinated, and the number of female patients vaccinated.
- Encourage friendly competition among providers or clinics.
- Provide appropriate incentives to providers and clinics and wards with high patient vaccination rates (e.g., pizza party).

Establish an influenza vaccination campaign committee, with diverse clinical and support membership.

- Use *Infection: Don't Pass It On* campaign and annual flu resource materials such as buttons, stickers, posters, and flu manual. Distribute flu buttons to staff, hang posters throughout the facility. Offer stickers to all who receive the vaccination.
- Critically review what is and isn't working well. Make mid-campaign corrections as needed.

AFTER your campaign

- Inform providers and teams (re: the number and percent of high-risk patients and female Veterans vaccinated).
- Critically review and evaluate your campaign after flu season.
- Identify and document strategies that worked.
- Thank your Flu Vaccination Champions through formal communications or recognition ceremonies.
- Celebrate your successes.

2. Employ System-wide Strategies

- Use electronic medical record clinical reminders.
- Use standing orders or protocols for inpatients (acute, community living center, domiciliaries, and mental health settings), outpatients, and home care patients.
- Use patient reminders (postcards/letters) and recall systems.
- Print flu messages on the back of appointment reminder letters.
- Provide flu updates and information on the facility and VISN (Internet) Web sites.
- Remove actual and perceived barriers (e.g., provide easier parking for flu shot clinics).
- Clear signage with dates, times, location of and directions to flu clinics.
- Have CCHT (Care Coordination Home Telehealth) coordinators encourage vaccination when interacting with patients.

3. Make It Convenient

- Expand access/outreach.
  - Extend clinic hours/days.
  - Schedule drop-in/walk-in vaccination days, "drive-through" vaccination.
  - Vaccinate in settings not routinely used for this purpose (hospital lobbies, Vet Centers, domiciliaries).
  - Bring the vaccine to residents (if possible) in VA residential facilities
  - Include influenza vaccination with home visits.
- Target all patients, including special populations, in clinics where they are likely to be seen (spinal cord injuries and disorders (SCI), Women's Health Clinic, HIV/ID clinics, homeless programs).
  - Include locations such as: all specialty clinics, dental clinic, triage and emergency rooms/departments.
  - Offer vaccination at convenient times and places, before and/or after a scheduled patient event, educational event, or mental health group.

4. Communicate, Remind, and Reinforce

Use multiple message formats and tools; regularly provide reminders and updates.

Educational materials such as a seasonal flu brochures or posters should be widely distributed and available for clinicians, Veterans, visitors, and staff.

Marketing Tools for Clinicians

- Provider e-mail, e-mail blast to all staff to communicate awareness of influenza campaign and to encourage Veterans to get vaccinated
- Screensavers with messages to providers and staff regarding the phases of the influenza campaign—"get ready," "vaccinations being given date/time," "it's not too late for your patient to get vaccinated"
- Provide "I got my flu shot" stickers to all clinicians who vaccinate patients. Also ask them to wear IDPIO "flu buttons" during flu season.

Marketing Tools for Veterans

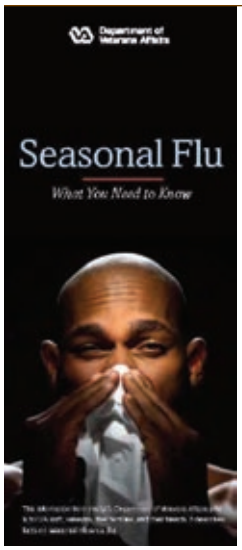
- "On hold" telephone recorded messages for callers
- Newsletters
- Posters
- Brochures
- Buttons
- Stickers
- Pens
- Cafeteria tray liners
- Table tents
- Phone calls and/or mailed reminders to outpatients. Provide return envelope, card or tear-off section of the letter, for Veterans to provide information if vaccinated at another location.
- Reminders to let VA know if vaccinated at another location on the back of appointment letters or other informational letters sent
- Reminders with pharmacy refills

Other Communication Tools

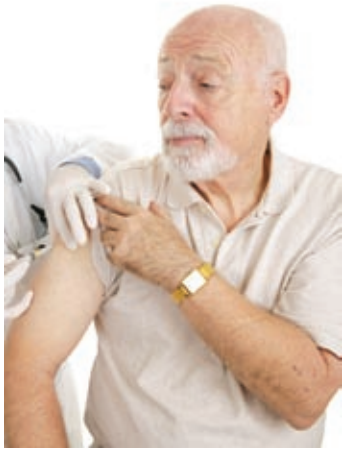
- Tools to help patients, employees, and volunteers keep track of their vaccinations:
  - Ask reason for patient's refusal of flu shot; discuss and dispel "flu shot myths."
  - Use facility and VISN Web sites to provide updates for number of Veterans, employees, and volunteers vaccinated.
  - Hang posters in elevators and restrooms. Change the posters at regular intervals.

5. Educate

- Provide fact sheets, brochures, and other flu information to Veterans and family sitting in clinic waiting areas. Written information should be direct and straightforward, using appropriate language and terminology, and at appropriate reading levels.
- Provide information on important everyday preventive actions: respiratory etiquette (cough in tissue or cough into sleeve) and hand hygiene (clean hands often after coughing, sneezing or after touching items in a public place; keep hands away from eyes nose and mouth).
- Broadcast information (e.g., influenza vaccine administration sites/dates/times, facts vs. myths and use VA and CDC podcasts on vaccination, respiratory etiquette and hand hygiene presented on VA TV/monitors) throughout the medical center to Veterans, their family, employees, trainees, and volunteers.
- Enlist providers and clinical staff from multiple disciplines, as well as pharmacists, students, interns, and residents to assist with inpatient and outpatient education efforts.
  - Work with nurse manager, health educator, prevention coordinator, or flu champion on using consistent educational materials.



Make it a standard for all providers to offer and administer seasonal flu vaccination.



Inform patients about:

- Vaccination is the best way to prevent getting the flu
- Who should get vaccinated each year
  - Vaccination is recommended for the following groups, because these persons either are at higher risk for influenza complications, or are close contacts of persons at higher risk:
    - all children aged 6 months–4 years (or older) who are at increased risk of complications from influenza;
    - persons aged ≥50 years;
    - women who will be pregnant during the influenza season;
    - persons who have chronic pulmonary (including asthma), cardiovascular (except hypertension), renal, hepatic, cognitive, neurologic/neuromuscular, hematological or metabolic disorders (including diabetes mellitus);
    - persons who have immunosuppression (including immunosuppression caused by medications or by human immunodeficiency virus);
    - residents of community living centers and other long-term care facilities;
    - health care personnel;
    - household contacts and caregivers of children aged <5 years and adults aged ≥50 years, with particular emphasis on vaccinating contacts of children aged <6 months; and
    - household contacts and caregivers of persons with medical conditions that put them at higher risk for severe complications from influenza.
- Potential side effects
  - The viruses in the flu shot are killed (inactivated) and cannot cause anyone to get the flu. Most people to receive the flu shot have no problems from it. Some people may get a low grade fever, and aches lasting one–two days after getting the shot—mild in comparison to the getting the flu. The injection may cause some discomfort, redness, or swelling where the shot was given, which resolves in a day or two. Re-emphasize that one cannot get the flu from the flu shot.
- When flu shots will be given—offer vaccinations at a convenient time and place. You may want to expand clinic hours.

Inform providers about:

- Veteran concerns—have RN, LPN, or health tech screen and offer vaccination, referring patient concerns to provider
- How to access and review the Veteran's vaccination history
- High risk patients—use of clinical reminders and health factors to identify these Veterans
- Annual seasonal influenza vaccination campaign goals and status of efforts to reach them
- Proper procedures for administration of the flu vaccines

Section IV

Resource Materials on Influenza Prevention

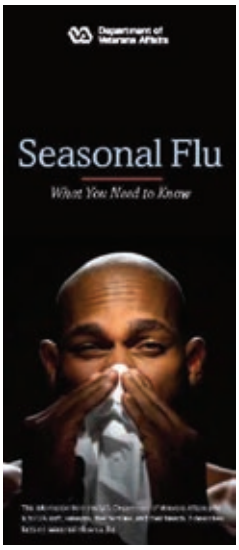
Resource Materials on Influenza Prevention

Resource materials for use in this year's flu vaccination campaign have been developed in three separate sets:

1. **New Posters and Brochures,**
2. **The 2009–2010 Seasonal Influenza Manual, and**
3. **Toolkit Accessories.**

1. New Posters and Brochures

The Infection: Don't Pass It On (IDPIO) campaign designed 15 new posters, one new large poster, and one seasonal flu brochure as new tools for you to hang in your facility and share with your CBOCs or long-term care sites. Print copies should arrive in September and will be posted on www.publichealth.va.gov/flu or VA intranet vaww. publichealth.va.gov/flu. The new seasonal flu brochure (and previous resource materials) is available for order through www.lms.va.gov—keyword: IDPIO. See "Ordering Instructions" and "Corrections" later in this section for availability of some older IDPIO and flu resource materials.



Brochure

Posters

Infection: Don't Pass It On

This manual is developed by the *Infection: Don't Pass It On (IDPIO)* campaign. IDPIO is an ongoing public health campaign to involve VA staff, Veterans, their families, and visitors in preventing the transmission of infection.

2. 2009–2010 Seasonal Flu Manual

This year's manual has been developed in stages, section by section. As sections are completed, they will be posted to our VA intranet site: vaww.publichealth.va.gov/flu. Once all sections of the manual are complete, they will be assembled into one document, printed and sent out to toolkits recipients (anticipated September 2009). Until the print version arrives, you may locate the manual at vaww.publichealth.va.gov/flu.

3. Toolkit Accessories

A box of toolkit accessories was mailed out late August. Use these many items as you promote flu vaccination to patients, employees, trainees, and volunteers at health fairs, staff meetings, and other hospital and clinics events; use them to reward those who come in for their vaccination. In addition to an IDPIO Resource Materials Catalog, accessories in the toolkit are focused on delivering reminders and messages on hand hygiene and respiratory etiquette. Those include:

- Drink Coasters
- Retractable Badge Holders
- Pens
- Mouse Pads
- Hand Hygiene Buttons
- Respiratory Etiquette Buttons
- Magnetic Phone Indexes
- Magnets
- Hand Sanitizer
- Stadium Cups

VA Staff Receiving a Toolkit

These kits are being mailed to **three key contact groups** in VA facilities:

- "Flu" coordinators at medical centers and long-term care facilities
- Occupational health clinicians
- Infection control professionals

Key contacts will receive posters, brochures and flu manuals. However, there are a limited number of toolkits. While *most* key contacts will receive these toolkits, there are not enough to send to *each* key contact. Please share resources with other VA colleagues who play important supporting roles in your seasonal flu and hand and respiratory hygiene campaigns. These include prevention managers, patient educators, education contacts, patient safety staff, MRSA coordinators, public affairs officers, and facility leadership. We encourage collaboration within VA facilities to reach patients, employees, trainees, and volunteers from all vantage points. The more groups who promote and participate in flu campaign efforts, the closer VA will be to meeting this year's goals. Please don't forget to share with your community based outpatient clinics (CBOCs), community living centers, domiciliaries, and other long-term and care sites within your catchment area.

How can I get more IDPIO and flu resources?

Some resources are available for order (posters, brochures, buttons, stickers, etc) through the Learning Management System (LMS). Use your IDPIO Resource Materials Catalog to view these (http://www.publichealth.va.gov/flu/materials/index.asp) or visit www.lms.gov to view available resources for order.

Ordering Instructions

1. Go to the VA Learning Management System (LMS) at www.lms.va.gov.
2. Log into LMS.
3. Search CATALOG by typing in "IDPIO" in the search catalog field at the top of page.
4. Select ***IDPIO: Infection Don't Pass It On*** from the search results.
5. Scroll down to RELATED DOCUMENTS and click (on the tiny blue arrow) to expand.
6. Select ***IDPIO: Infection Don't Pass It On & Flu Resources*** *Documents*. This document displays all printed posters, brochures and other IDPIO educational resources available for order. Note the product titles and EES order numbers for each. You may wish to print this document as you'll need all this information to complete your order.
7. Return to RELATED DOCUMENTS by minimizing the resources list.
8. Select the ORDER THIS PRODUCT button to place an order.
9. Fill in all of the required IDPIO Order Form information found in the body of the Outlook e-mail message. This information will be transmitted directly to the *EES Distribution* team via Outlook e-mail for processing. List all product titles, order numbers, and quantities separately for each product you order.
10. After the form has been completely filled, complete your product order by clicking on the SEND BUTTON.

Note: *The EES Distribution team will not deliver to home addresses.* The request must come from a VA e-mail address to be received and processed. Orders are shipped within 3–5 business days unless otherwise specified in the special instructions. For assistance, e-mail publichealth@va.gov or call 202-461-1040.

*Corrections: IDPIO Resource Materials Catalog (August 2009)

The following items have been removed from the catalog and print versions are no longer available to order through the EES catalog on LMS. However, all the posters listed may still be downloaded or printed from our IDPIO Web sites:

VA Internet at www.publichealth.va.gov/InfectionDontPassItOn or

VA intranet at vaww.publichealth.va.gov/InfectionDontPassItOn.

Hands 34Sp	Patients & Visitors: It's Okay...	F60592
Hands 8Sp	Clean Your Hands	F60593
Prevent 8Sp	Stop	F60595
Prevent 6Sp	Don't Let Germs	F60596
Hands 21	The juice is worth the squeeze	F60621
Hands 19	Things we have a hard time	F60622
Wash 11	We're Counting on You.....	F60691
Flu 14Sp	Cold vs Flu	F60698
Flu 13Sp	Seasonal Flu vs Pandemic Flu	F60706
	2004 Spanish Posters	F60405
Prevent 16Sp	Germs...Beware	F60709
Flu 19	I'll protect my baby	F60723
Flu 22	My Dad lives with me	F60724
Flu 21	My little girl has diabetes	F60726
Flu 17	Staying Healthy	F60727
Flu 18Sp	My Doctor wants...	F60729
Flu 20Sp	Protect my family	F60730
Flu 19Sp	I'll protect my baby	F60731
Flu 16Sp	Chronic health condition	F60732

How can I print the posters directly from the Web?

The poster number is located on the bottom right corner of the poster. Find the poster you want at the Web sites below and right click on it to either print it or save (download) it to print later. You will find the posters in picture or PDF formats. Visit:

- www.publichealth.va.gov/flu/materials/posters.asp
- vaww.publichealth.va.gov/flu/materials/posters.asp (VA Staff Only)

What buttons and stickers are available for flu season?

Buttons: Two NEW button designs were included in the 2009–2010 influenza toolkits. Two other button designs are available through the LMS ordering system (see ordering instructions above). VA employees, trainees, and volunteers can wear these to encourage conversation between employees, volunteers, and patients on influenza vaccinations.

Stickers: Two sticker designs are available through the LMS ordering system (see ordering instructions above). These can be distributed to employees, volunteers, and patients who have received their influenza vaccine. Every time someone in VA gets vaccinated for flu, she/he should get a sticker to wear.

How can I use IDPIO and FLU posters effectively?

The Infection: Don't Pass It On (IDPIO) campaign has produced over 100 posters since fall 2004. These represent hand and respiratory hygiene, hand washing, influenza, and personal protective equipment.

The code in the lower right of each poster includes the target audience with the words "ALL," "STAFF AREAS ONLY," or "CLINICAL." The posters marked:

- **All (General Audience):** are intended for use anywhere in a hospital or clinic. For example, patient waiting areas, visitor waiting areas, hallways, elevators, restrooms, outside patient rooms, at the entryways to special areas (like Intensive Care Units or Endoscopy Suites), desktops, etc. These posters have the word "All" next to their number at the bottom of the poster.
- **Clinical:** are often very similar to the "All" posters but use more technical language. In some cases, the difference is just the use of the word "decontaminate" rather than "wash." These posters can be used anywhere but are intended for areas (e.g., staff lounges or staff restrooms) where they will be seen primarily by employees, trainees, and volunteers who appreciate the more technical language and details. These posters have the word "Clinical" next to their number at the bottom of the poster.
- **Staff Areas Only:** have messages that are intended only for employees, trainees, and volunteers. The points are intended to be thought-provoking and they contain technical (Hands 26) or health care references (Hands 27) that most people who do not work in health care would not understand nor benefit from reading. These posters should not be in view of the patients, and be put **only** in areas exclusive to staff, such as break areas and locker rooms. These posters have the words "Staff Areas Only" next to their number at the bottom of the poster.

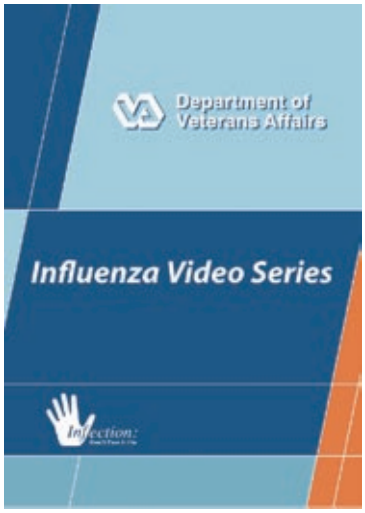
Where do I hang the posters?

Use the posters in places that will get these messages to the VA community. Place them in multiple sites throughout hospitals, clinics, domiciliaries, Community Living Centers, Vet Centers, etc. Posters can be hung or placed at reception desks, waiting areas, exam rooms, rest rooms, meeting/conference rooms, cafeterias, established kiosks, elevators, and bulletin boards. Rotate them often (weekly or monthly). The "Restroom" and "Wash" posters may be used in restrooms; hung near urinals, in stalls, on mirrors, sinks, or soap dispensers. Posters may also be hung on restroom doors, especially so they can be seen upon exiting the restroom. Posters for employees, trainees, and volunteers can be placed in staff lounges, locker rooms, and offices.

Seasonal flu resource materials from the Centers for Disease Control and Prevention (CDC) are available on the Internet at http://www.cdc.gov/flu/professionals/flugallery/index.htm#materials

Influenza Video Series

The IDPIO campaign has developed a total of seven videos, six of which are video clips approximately 2–3 minutes long.



- Four short clips are targeted toward a *general audience* (Veteran patients, family, visitors and even VA staff) and focus on vaccination for seasonal flu, hand hygiene, respiratory etiquette, and how flu is spread. **These four clips are not for clinical instruction.**
- Two short clips are intended for health care providers and others within the medical care setting. These focus on donning and doffing personal protective equipment (PPE) for combined airborne infection isolation and contact precautions.
- A 14-minute video on seasonal flu for a *general audience* is also included. Its "game show" format is both fun and informational for staff, patients and visitors.

All of the videos are posted for viewing at http://www.publichealth.va.gov/flu/materials/videos.asp and http://vaww.publichealth.va.gov/flu/materials/videos.asp.

Pandemic Flu and H1N1 Resources Materials

VA developed a fact sheet for veterans and VA staff on 2009 H1N1 Influenza that is available for downloading at http://vaww.vhaco.va.gov/pubhealth/H1N1Flu/docs/VA%20H1N1%20Factsheet_050809_FINAL_508.pdf

Other VA guidance and resources are posted at http://vaww.vhaco.va.gov/pubhealth/H1N1Flu/index.htm

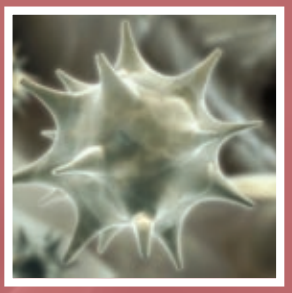
Brochures and posters on pandemic related topics can be found at http://www.publichealth.va.gov/flu/materials/index.asp

and for VA staff only at http://vaww.publichealth.va.gov/flu/materials/index.asp

CDC and HHS are the federal sources of information on Novel H1N1 Influenza. Resources can be located at: http://www.flu.gov/ and http://www.cdc.gov/h1n1flu/

Section V

Implications of Novel Influenza A (H1N1)



Implications of Novel Influenza A (H1N1)

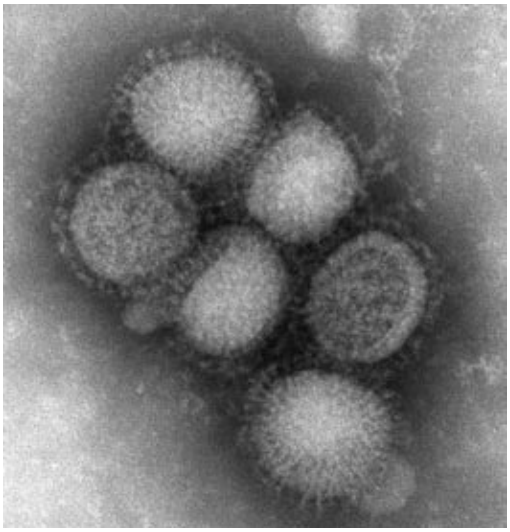
Background

The novel influenza A (H1N1) is a new influenza virus causing illness in people. This new virus was first detected in people in the United States in April 2009. This particular H1N1 strain had not circulated previously in humans. It continues to spread and cause illness even as the summer progresses, an unusual trend for this normally winter time disease. By late June, the Centers for Disease Control and Prevention (CDC) estimated that already over a million cases of the novel H1N1 influenza in the United States.

On June 11, 2009, the World Health Organization (WHO) raised the worldwide pandemic alert level to Phase 6, indicating that the novel H1N1 influenza strain has shown sustained worldwide spread. At this time, WHO has indicated this seems to be a moderately severe pandemic. Because there is already widespread novel H1N1 influenza disease in the United States, the WHO Phase 6 declaration did not change what the United States is doing to keep people healthy and protected from the virus.

The CDC has developed the U.S. Pandemic Severity Index (PSI) to describe the severity of a pandemic in terms of illness and death. See the table below for definitions of the selected index levels and recommended responses.

- The U.S. PSI scale is based on the case-fatality ratio; the likelihood of people dying from the disease.
- The PSI scale ranges from Category 1 to Category 5 and is comparable to the U.S. hurricane severity index.



- Category 1 is the least severe and Category 5 is the most severe. In late June, the CDC estimated that the pandemic situation in the U.S. would be equivalent to a pandemic severity index of 2. (This is most similar to the 1957 influenza pandemic. It is uncertain how the current situation will evolve over the coming months and it is not possible to make a predication about deaths at this time.)
- CDC will re-evaluate the classification of the Pandemic Severity Index should there be evidence that the pandemic has become more severe.
- The PSI will be adjusted based on that evaluation and appropriate guidelines and recommendations provided.
- CDC emphasizes that unnecessary weight not be given to the numeric categorization of the pandemic.
- The importance of identifying a category of severity helps guide public health interventions for individuals and communities.

The Federal source of clinical information pertaining to novel influenza A (H1N1) is the CDC.
Visit www.cdc.gov/h1n1flu/

What we know to date:

- There has not been an extensive pattern of very severe illness related to those infected with this virus, but it does appear more severe than seasonal influenza for certain groups, for example those younger than 65 years old.
- Results of a serological study conducted by CDC suggest that some adults, especially adults older than 60, may have a degree of preexisting cross-reactive antibody to the novel H1N1 influenza virus.
- This virus does not have genetic markers for virulence found in the 1918 pandemic virus or in the H5N1 virus in Asia that has been lethal among people.

There is potential for the virus to change and cause more severe disease. The real uncertainty is how the novel H1N1 virus will affect the 2009–2010 influenza season in the United States.

PSI Severity Definitions and Recommended Interventions

Severity Level	Level Definitions	Recommended Public Health Interventions
PSI Category 1–3 pandemic:	**A PSI category 1 pandemic has the following:** • Case fatality ratio of less than 0.1 percent • Excess death rate of less than 30 per 100,000 people • Illness rate of 20–40% of the population • Less than 90,000 potential deaths (based on 2006 U.S. population) • Similar to a more severe seasonal flu year in the United States **A PSI category 2 pandemic has the following:** • Case fatality ratio of 0.1 percent to less than 0.5 percent • Between 90,000 and 450,000 deaths in the U.S. (based on 2006 U.S. population) • Excess death rate of between 30 to less than 150 per 100,000 people • Illness rate of between 20 and 40 percent • Similar to 1957 pandemic	• Ill adults and children are asked to stay home voluntarily. • If someone in the household is sick, well adults and children do not need to stay at home. • School and child care dismissal is not generally recommended, but may be considered depending on the local impact of the disease. • Workplace and community adult social distancing efforts (e.g., encouraging teleconferences instead of meetings, reducing density, meaning the number of people crowded into an enclosed space, in public transit and the workplace, postponing or canceling selected public gatherings, encouraging people to telework or take staggered shifts) are generally not recommended.
PSI Category 4–5 pandemic	**A PSI category 5 pandemic has the following:** • Case fatality ratio of greater or equal to 2 percent • Excess death rate of more than 600 per 100,000 people • Illness rate of 20–40% of the population • Greater than or equal to 1.8 million potential deaths (based on 2006 U.S. population) • Similar to the 1918 pandemic	• Ill adults and children are asked to stay home voluntarily. • If someone in the household is sick, well adults and children should stay at home too. • School and child care dismissal is recommended for up to 12 weeks. • Workplace and community adult social distancing efforts (e.g., encouraging teleconferences instead of meetings, reducing density, meaning the number of people crowded into an enclosed space, in public transit and the workplace, postponing or canceling selected public gatherings, encouraging people to telework or take staggered shifts) are recommended.

The Federal Response

The Federal Government is addressing this newly declared pandemic. CDC's goals during this public health emergency are to reduce transmission and illness severity, and provide information to assist health care providers, public health officials and the public in addressing the challenges posed by this newly identified influenza virus. To this end, CDC continues to update guidance, including actions that professionals, the general public and groups can take on their own to reduce the risk of infection. Visit the CDC Web site at http://www.cdc.gov/h1n1flu/ for more information or call 1-800-CDC-INFO.

The Office of Personnel Management has developed guidance on policies and procedures to prepare for pandemic influenza. For online resources and a full range of the latest human resources flexibilities and benefits relating to pandemic influenza, go to www.opm.gov/pandemic/.

Vaccines are a very important part of a response to pandemic influenza. CDC isolated the novel H1N1 influenza virus, made a candidate vaccine virus, and has provided this virus to industry so it can begin production of a vaccine. Even if things go well, and industry develops a full scale production process, it will still be several months until the vaccine becomes available. The vaccine will be owned by the U.S. government and will be distributed free of charge to the public and private sectors. The vaccine will not be available for sale (CDC Questions and Answers on vaccine appear later in this section).

The U. S. Department of Health and Human Services (HHS) is working with its advisory committees to decide which groups will be offered vaccine and in what priority order. VA intends to follow the prioritization guidance, interpreted for our staff and patient populations. The goal will be to vaccinate all staff and enrolled patients who are eligible for and those who want to receive the vaccine.

Because of the many issues involved in dealing with this novel strain, HHS has created www.flu.gov as a resource for information and guidance about novel H1N1 influenza. This one-stop comprehensive site brings together flu-related information from across HHS and other federal agencies. The expanded site builds on the pandemic planning information long presented on www.pandemicflu.gov, and incorporates information about the novel H1N1 flu as well as the seasonal flu.

The vaccine for novel influenza A (H1N1) will be different from the vaccine for seasonal influenza.

The VA Response

From the advent of the 2009 novel H1N1 influenza infection, various VA program offices have been working together (and with other federal agencies) to provide guidance and resources to facilities, staff and Veterans to allow for continued operations and care services within VA and VHA.

Resources for Veterans: Prevention measures to combat novel H1N1 influenza infection, fact sheets, VA contact information and a link to H1N1 Web sites for flu updates and guidance are available at http://www.publichealth.va.gov/h1n1flu/

Resources for Staff: The Office of Public Health and Environmental Hazards maintains a Web site, http://vaww.vhaco.va.gov/pubhealth/H1N1Flu/index.htm. The Web site contains guidance for use within VA and VA facilities :

- infection control,
- antiviral supplies,
- occupational health,
- human resources,
- testing and treatment of the novel H1N1 influenza virus,
- communication strategies, and
- frequently asked questions and answers.

Novel H1N1 Influenza Vaccine

http://www.cdc.gov/h1n1flu/vaccination/public/vaccination_qa_pub.htm

Questions & Answers (Aug. 3, 2009)

Q. What are the plans for developing novel H1N1 vaccine?

A. Vaccine is the most powerful public health tool for control of influenza, and the U.S. government is working closely with manufacturers to take steps to manufacture a novel H1N1 vaccine. Working together with scientists in the public and private sector, CDC has isolated the new H1N1 virus and modified the virus so that it can be used to make hundreds of millions of doses of vaccine. Vaccine manufacturers are now using these materials to begin vaccine production. Making vaccine is a multi-step process which takes several months to complete. Candidate vaccines will be tested in clinical trials over the next few months.

Q. When is it expected that the novel H1N1 vaccine will be available?

A. The novel H1N1 vaccine is expected to be available in the fall. More specific dates cannot be provided at this time as vaccine availability depends on several factors including manufacturing time and time needed to conduct clinical trials

Q. Can the seasonal vaccine and the novel H1N1 vaccine be given at the same time?

A. It is anticipated that seasonal flu and novel H1N1 vaccines may be administered on the same day. However, we expect the seasonal vaccine to be available earlier than the H1N1 vaccine. The usual seasonal influenza viruses are still expected to cause illness this fall and winter. Individuals are strongly encouraged to get their seasonal flu vaccine as soon as it is available.

Q. Will the seasonal flu vaccine also protect against the novel H1N1 flu?

A. The seasonal flu vaccine is not expected to protect against the novel H1N1 flu.

Q. Who will be recommended as priority groups to receive the novel H1N1 vaccine?

A. CDC's Advisory Committee on Immunization Practices (ACIP) has recommended that certain groups of the population receive the novel H1N1 vaccine when it first becomes available. These key populations include pregnant women, people who live with or care for children younger than 6 months of age, health care and emergency services personnel, persons between the ages of 6 months and 24 years old, and people aged 25 through 64 years old who are at higher risk for novel H1N1 because of chronic health disorders or compromised immune systems.

While we do not anticipate a shortage of novel H1N1 vaccine, availability and demand can be difficult to predict. There is some possibility that initially the vaccine will be available in limited quantities. In this scenario, the committee recommended that the following groups receive the vaccine before others: pregnant women, people who live with or care for children younger than 6 months of age, health care and emergency services personnel with direct patient contact, children 6 months through 4 years of age, and children 5 through 18 years of age who have chronic medical conditions.

The committee recognized the need to assess supply and demand issues at the local level. The committee further recommended that once the demand for vaccine for these prioritized groups has been met at the local level, programs and providers should begin vaccinating everyone from ages 25 through 64 years. Current studies of novel influenza A (H1N1) indicate the risk for infection among persons age 65 or older is less than the risk for younger age groups. Therefore,

as vaccine supply and demand for vaccine among younger age groups is being met, programs and providers should offer vaccination to people over the age of 65.

Q. Where will the vaccine be available?
A. Every state is developing a vaccine delivery plan. Vaccine will be available in a combination of settings such as vaccination clinics organized by local health departments, health care provider offices, schools, and other private settings, such as pharmacies and workplaces.

Q. Are there other ways to prevent the spread of illness?
A. YES. Take everyday actions to stay healthy.

- Cover your nose and mouth with a tissue when you cough or sneeze. Throw the tissue in the trash after you use it.
- Wash your hands often with soap and water, especially after you cough or sneeze. Alcohol-based hands cleaners are also effective.
- Avoid touching your eyes, nose or mouth. Germs spread that way.
- Stay home if you get sick. CDC recommends that you stay home from work or school and limit contact with others to keep from infecting them.

Follow public health advice regarding school closures, avoiding crowds and other social distancing measures. These measures will continue to be important after a novel H1N1 vaccine is available because they can prevent the spread of other viruses that cause respiratory infections.

Q. Will vaccination against the new H1N1 influenza be mandatory?
A. NO. CDC and ACIP (The Advisory Committee on Immunization Practices, which provides advice and guidance on the control of vaccine-preventable diseases) will make recommendations for who should receive H1N1 vaccine, and state and local health departments and institutions will determine how to implement these recommendations. If the vaccine is recommended for use, those who choose vaccination for themselves or their children will be screened for contraindications to vaccination (such as an allergy to eggs) and will receive information sheets describing the vaccine's risks and benefits, possible adverse events associated with vaccination, and how to report these events. Individuals retain the right to refuse vaccination.

Pneumococcal Vaccine

All people who have existing indications for pneumococcal polysaccharide vaccine (PPSV23) should continue to be vaccinated according to current ACIP recommendations during the outbreak of novel H1N1 influenza. Emphasis should be placed on vaccinating people aged less than 65 years who have established high-risk conditions because PPSV23 coverage among this group is low and because people in this group appear to be overrepresented among severe cases of novel H1N1 influenza infection, based on data available in June 2009.

Use of PPSV23 among people without current indications for vaccination is not recommended at this time. This recommendation may be revised as the epidemiology and clinical presentation of novel H1N1 influenza virus infection as well as the frequency and severity of secondary pneumococcal infections are better understood.

Use of Antivirals

Antiviral Resistance

This novel (H1N1) influenza virus is sensitive (susceptible) to the neuraminidase inhibitor antiviral medications, zanamivir and oseltamivir. It is resistant to the adamantane antiviral medications, amantadine and rimantadine.

Safety of Pandemic Vaccines
6 AUGUST 2009 | The World Health Organization (WHO) is aware of some media reports that have expressed concern about the safety of vaccines for pandemic influenza. The public needs to be reassured that regulatory procedures in place for the licensing of pandemic vaccines, including procedures for expediting regulatory approval, are rigorous and do not compromise safety or quality controls. Visit http://www.who.int/csr/disease/swineflu/notes/h1n1_safety_vaccines_20090805/en/index.html

Table 1. Antiviral medication dosing recommendations for treatment or chemoprophylaxis of novel influenza A (H1N1) infection. (Table extracted from IDSA guidelines for seasonal influenza.)

Agent, group		Treatment	Chemoprophylaxis
Oseltamivir			
Adults		75-mg capsule twice per day for 5 days	75-mg capsule once per day
Children ≥ 12 months	15 kg or less	60 mg per day divided into 2 doses	30 mg once per day
	16–23 kg	90 mg per day divided into 2 doses	45 mg once per day
	24–40 kg	120 mg per day divided into 2 doses	60 mg once per day
	>40 kg	150 mg per day divided into 2 doses	75 mg once per day
Zanamivir			
Adults		Two 5-mg inhalations (10 mg total) twice per day	Two 5-mg inhalations (10 mg total) once per day
Children		Two 5-mg inhalations (10 mg total) twice per day (age, 7 years or older)	Two 5-mg inhalations (10 mg total) once per day (age, 5 years or older)

Antiviral Treatment for Novel (H1N1) Influenza

For antiviral treatment of novel influenza (H1N1) virus infection, either oseltamivir or zanamivir are recommended (see Table 1). Recommendations for use of antivirals may change as data on antiviral effectiveness, clinical spectrum of illness, adverse events from antiviral use, and antiviral susceptibility data become available. For current information, visit http://www.cdc.gov/h1n1flu/recommendations.htm .

Laboratory Testing

Testing recommendations for novel influenza A (H1N1) continue to evolve. Resources for patient testing vary by locale and may depend on local and state public health laboratory resources. For additional guidance for health care providers on rapid screening tests visit http://www.cdc.gov/h1n1flu/specimencollection.htm. Discuss local resources with your facility laboratory directors. See also: Evaluation of Rapid Influenza Diagnostic Tests for Detection of Novel Influenza A (H1N1) Virus; 58(30); 826-829 – United States, August 7, 2009. Available at http://www.cdc.gov/mmwr/preview/mmwrhtml/mm5830a2.htm

None of these tests should be used to determine when an infected individual is no longer contagious.

Available tests and recommendations:

- Serological testing is not widely available and is generally not useful except for retrospective epidemiological and research studies.
- The so-called "rapid tests" are FDA approved and available in many laboratory settings but vary in sensitivity from 10–70%. In general false negatives occur more often in adults than in children. A negative test result can come from a patient suffering from 2009 novel H1N1 influenza infection so should not be relied upon to rule out influenza infection. Similar issues are found with immunofluorescence ("DFA" or "IFA") tests for influenza.
- Confirmation of novel influenza A (H1N1) infection may be important in special situations, e.g., severely ill patients, patients with immunocompromising conditions, and pregnant and breast feeding women. For this real-time reverse transcriptase-polymerase chain reaction (rRT-PCR) may be useful. Real-

time RT-PCR is the recommended test for confirmation of novel influenza A (H1N1) cases and is the most sensitive test. Confirmation as novel influenza A (H1N1) virus by real-time RT-PCR was originally performed only at CDC, but at this time may be available in state public health laboratories. Two RT-PCR tests are now FDA approved and may be available elsewhere.

- In viral cultures, isolation of novel influenza A (H1N1) virus is diagnostic of infection, but may not yield timely results for clinical management. A negative viral culture does not exclude infection with novel influenza A (H1N1) virus.

CDC Guidance on Infection Control Issues

As research continues on the virulence and transmissibility of this new strain, see www.cdc.gov/h1n1flu for the most current information. The information below is adapted from http://www.cdc.gov/h1n1flu/guidelines_infection_control.htm.

implementation of respiratory hygiene/cough etiquette

To prevent the transmission of **all** respiratory infections in health care settings, including novel H1N1 influenza, respiratory hygiene/cough etiquette infection control measures (see Respiratory Hygiene/Cough Etiquette in Healthcare Settings) should be implemented at the first point of contact with a potentially infected person. They should be incorporated into infection control practices as one component of Standard Precautions.

Health care facilities should establish mechanisms to screen patients for signs and symptoms of febrile respiratory illness at all points of entry into the facility. Provisions should be made to allow for prompt isolation and assessment of symptomatic patients.

Patient placement and transport

Patients who have a confirmed, probable, or suspected case of novel H1N1 influenza and present for care should be placed directly into individual rooms with the door kept closed.

Procedures that are likely to generate aerosols (e.g., bronchoscopy, elective intubation, suctioning, administering nebulized medications), should be performed in an airborne infection isolation room (AIIR) with negative pressure air handling with 6 to 12 air changes per hour. Air can be exhausted directly outside or be recirculated after filtration by a high efficiency particulate air (HEPA) filter. Facilities should monitor and document the proper negative-pressure function of AIIRs, including those in operating rooms, intensive care units, emergency departments, and procedure rooms.

Procedures for transport of patients in isolation precautions should be followed. Facilities should also ensure that plans are in place to communicate information about suspected cases that are transferred to other departments in the facility (e.g., radiology, laboratory) and other facilities. The **ill person should wear a surgical mask to contain secretions when outside of the patient room** and should be encouraged to perform hand hygiene frequently and follow respiratory hygiene/cough etiquette practices.

Isolation precautions

All health care personnel who enter the patient's room should use **standard and contact precautions. Eye protection should be used** for all patient care activities for patients being evaluated or in isolation for novel H1N1 influenza. Maintain adherence to **hand hygiene by washing with soap and water or using alcohol-based hand sanitizer** immediately after removing gloves and other equipment and after any

contact with respiratory secretions. Don gloves, gowns and eye protection when entering a patient's room (see Personal Protective Equipment (PPE) in Healthcare Settings at the CDC Web site).

Respiratory protection: At the time of this writing, all health care personnel who enter the rooms of patients in isolation with confirmed, suspected, or probable novel H1N1 influenza should wear a fit-tested disposable N95 respirator or better. Respiratory protection should be donned when entering a patient's room.

Note that this recommendation differs from current infection control guidance for seasonal influenza, which recommends that health care personnel wear surgical masks for patient care. The rationale is that a more conservative approach is needed until more is known about the specific transmission characteristics of this new virus. This recommendation is also outlined in the CDC's October 2006 "Interim Guidance on Planning for the Use of Surgical Masks and Respirators in Healthcare Settings during an Influenza Pandemic."

Some organizations have made recommendations to use surgical masks for the care of patients with novel H1N1 influenza. VA caregivers should follow VA direction in such situations. At the time of this publication, VA requires the use of N95 or better respirators for those giving direct patient care. VA preparations for pandemic influenza have resulted in ample supplies of N95 or better respirators. For updates, go to http://vaww.vhaco.va.gov/pubhealth/H1N1Flu/index.htm

Limiting health care personnel entering the isolation room

Health care personnel entering the room of a patient in isolation should be limited to those performing direct patient care. See http://www.cdc.gov/h1n1flu/guidelines_infection_control.htm

All health care workers in direct patient care, including pregnant women, should follow standard precautions with all patients, regardless of infection status. Appropriate respiratory protection is critical.

See http://www.cdc.gov/h1n1flu/guidance/pregnant-hcw-educators.htm for updates.

Pregnant women who will likely be in direct contact with patients with confirmed, probable, or suspected influenza A (H1N1) (e.g., a nurse, physician, or respiratory therapist caring for hospitalized patients), should consider reassignment to lower-risk activities, such as telephone triage.

If reassignment is not possible, pregnant women should avoid participating in procedures that may generate increased small-particle aerosols of respiratory secretions in patients with known or suspected influenza, including the following procedures:

- Endotracheal intubation
- Aerosolized or nebulized medication administration
- Diagnostic sputum induction
- Bronchoscopy
- Airway suctioning
- Positive pressure ventilation via face mask (e.g., BiPAP and CPAP)
- High-frequency oscillatory ventilation

See http://www.cdc.gov/h1n1flu/guidance/pregnant-hcw-educators.htm for updates.

Duration of precautions

Persons with novel H1N1 influenza virus infection should be considered potentially contagious from one day before to 7 days following illness onset. Persons who continue to be ill longer than 7 days after illness onset should be considered potentially contagious until symptoms have resolved. Children, especially younger children, might be contagious for longer periods.

Isolation precautions should be continued for 7 days from symptom onset or until the resolution of symptoms, whichever is longer.

Management of visitors

Limit visitors for patients in isolation for novel H1N1 influenza infection to persons who are necessary for the patient's emotional well-being and care. Visitors who have been in contact with the patient before and during hospitalization are a possible source of novel H1N1 flu. Therefore, schedule and control visits to allow for appropriate screening for acute respiratory illness before entering the hospital and appropriate instruction on use of personal protective equipment and other precautions (e.g., hand hygiene, limiting surfaces touched) while in the patient's room. Visitors of patients with novel H1N1 influenza infection should be instructed to limit their movement within the facility.

Visitors entering the room of patients with novel H1N1 influenza infection may be offered a gown, gloves, eye protection, and respiratory protection (i.e., N95 respirator) and should be instructed by health care personnel on their use before entering the patient's room.

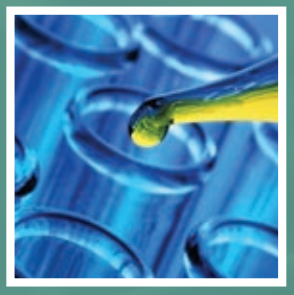
Plan for a surge of patients and increased demands for your services

Consider using your telephone system to deliver messages to incoming callers about when to seek medical care at your facility, when to seek emergency care, and where to go for information about caring for a person with flu at home. Consider extending your hours of operation to include telephone triage of patients during a community outbreak.

For answers to frequently asked questions, visit the CDC's Novel Influenza A (H1N1) Web site at http://www.cdc.gov/h1n1flu/qa.htm.

Section VI

Frequently Asked Questions (FAQs) on Influenza and Influenza Vaccination



Frequently Asked Questions (FAQs) on Influenza and Influenza Vaccination

1. General Questions

How is influenza illness defined?

Influenza is a febrile respiratory illness caused by influenza virus that can be prevented by vaccination. The table below differentiates influenza from a "cold."

What are complications of influenza?

Complications of influenza can include: dehydration, worsening of chronic medical conditions (i.e., asthma, diabetes, congestive heart failure), and bacterial pneumonia. Children may get sinus and ear infections.

Some people, such as older people, young children, and those with certain health conditions are at higher risk for serious influenza complications. Pregnant women are also more susceptible to serious complications.

New information is evolving concerning how novel H1N1 flu differs from seasonal flu concerning complications.

What should everyone know about the influenza season?

This year's flu season is unique since novel H1N1 flu virus has been circulating. That makes the 2009–2010 seasonal influenza season different. Flu activity has been occurring for several months throughout the U.S. and worldwide, so getting your seasonal influenza vaccination is very important this fall.

The first cases of seasonal influenza in the United States are usually identified in October and can last as late as May.

- 5–20 percent of the population gets the influenza in the United States each year.

Symptoms	Cold	Flu
Fever	Rare	Usual—can be 100 to 102° or higher, lasting 3–4 days
Chills	Uncommon	Common
Muscle aches and pains	Uncommon or mild	Common—can be severe
Headache	Uncommon	Common—can come on suddenly and be severe
Feeling tired and weak	Sometimes—usually mild; you don't feel tired	Common—can be moderate to severe; can last for 2–3 weeks. You can feel extreme tiredness that occurs suddenly
Coughing	Common—mild to moderate hacking	Common—can become severe and last for several weeks
Sneezing	Common	Sometimes
Stuffy nose	Common	Sometimes
Sore throat	Common	Sometimes
Chest discomfort	Sometimes—can be mild to moderate	Common—can be severe

- Widespread influenza activity appears six to ten weeks after the first case.
- Influenza kills about 36,000 and hospitalizes over 226,000 persons in the United States each year.

What should everyone know about the influenza vaccine?

This year, influenza vaccination for seasonal flu will begin earlier for all persons.

- The influenza vaccine is changed each year to match the currently circulating type of influenza. The influenza vaccine composition to be used in the 2009–2010 season in the United States is identical to that recommended by the World Health Organization. The trivalent influenza vaccine to be used in 2009–2010 is similar to that of the previous season, in order to provide as close a match to the known circulating strains of flu viruses in the most recent typical flu season.
- The **2009–2010 influenza vaccine** contains the following types:
  - an A/Brisbane/59/2007 (H1N1)-like virus; *
  - an A/Brisbane/10/2007 (H3N2)-like virus; **
  - a B/Brisbane/60/2008-like virus. (note this is the only change from last season's vaccine).

*A/Brisbane/59/2007 is a current vaccine virus; A/South Dakota/6/2007 (an A/Brisbane/59/2007-like virus) is a current vaccine virus used in live attenuated vaccines.
**A/Brisbane/10/2007 and A/Uruguay/716/2007 (an A/Brisbane/10/2007-like virus) are current vaccine viruses.

The influenza vaccine composition to be used in the 2009–2010 influenza season in the U.S. is identical to that recommended by the World Health Organization on February 12, 2009, for the Northern Hemisphere's 2009–2010 influenza season.

- One needs an influenza vaccine *each year* to get the latest protection for seasonal flu.
- Influenza vaccination usually begins in September (for high-risk patients seeking medical care), per CDC guidelines and if vaccine is available. An additional flu vaccine for H1N1 flu will be available this fall.
- There is always a possibility of a less than optimal match between the virus strains predicted to circulate and the virus strains that end up causing the most illness. Even if the vaccine and the circulating strains are not an exact match, the vaccine may reduce the severity of the illness or may help prevent influenza-related complications.
- Additional references for more information concerning seasonal influenza vaccine:
  - FDA Web page on Influenza Vaccine Safety & Availability http://www.fda.gov/BiologicsBloodVaccines/SafetyAvailability/VaccineSafety/ucm110288.htm
  - FDA List of Strains Included in the 2009–2010 Influenza Vaccine http://www.fda.gov/BiologicsBloodVaccines/GuidanceComplianceRegulatoryInformation/Post-MarketActivities/LotReleases/ucm162050.htm
  - U.S. Centers for Disease Control and Prevention Web page on Seasonal Influenza Resources for Health Professionals http://www.cdc.gov/flu/professionals/vaccination/
  - U.S. Centers for Disease Control and Prevention Web page with Key Fact About Seasonal Flu Vaccine http://www.cdc.gov/flu/protect/keyfacts

When should flu vaccine be given?

- Flu vaccine should be given to enrolled Veterans when it is received at the facility rather than waiting several weeks to release the doses. Timing of flu vaccine campaigns is important.
- This year, there will be an additional flu vaccine, novel H1N1 flu vaccine, to be given. This is a unique flu vaccine and not the same as the seasonal flu vaccine. Each flu vaccine provides protection against differing flu viruses. The novel H1N1 flu vaccine should be given to enrolled Veterans when it is received at the facility. Guidance documents will be available from the VA and CDC to assist with planning which groups of patients and employees are to receive the novel H1N1 flu vaccine first.
- Seasonal flu vaccine campaigns should continue, depending on availability of influenza vaccine, through March. Flu vaccine may be given until the flu vaccine expires (usually June), depending on local flu activity that may persist beyond the usual annual flu season. VA encourages vaccinating patients throughout the entire campaign.

How long does it take for the influenza vaccine to work?

The vaccine stimulates production of antibodies that provide protection against the influenza viruses in the vaccine. Influenza vaccine causes your body to generate protective immunity in about two weeks.

The ability of the influenza vaccine to protect a person depends on the health status (immune system especially) and age of the individual, and the "match" or similarity between the virus strains in the vaccine and the circulating influenza strains. Studies have proven that both the influenza shot and the nasal-spray influenza vaccine are effective in preventing the influenza virus.

One influenza vaccine shot will protect most people from influenza during the flu season.

Should the elderly receive a second dose of seasonal flu vaccine later in the flu season each year?

No. According to the CDC, flu vaccine should be given as soon as it becomes available. It is not recommended to delay administration of flu vaccine to later in the flu season for the elderly or those living in community living centers and there is no research that adequately supports giving a second dose of flu vaccine during the flu season to the elderly. One dose of flu vaccine per flu season is recommended.

NOTE: the H1N1 flu vaccine will be given in two doses, 21–28 days apart. This is a different flu vaccine than the seasonal flu vaccine.

Should travelers to the Southern Hemisphere from the Northern Hemisphere (or vice versa) receive a second dose of flu vaccine later in the same flu season?

Per the CDC:

The risk for exposure to influenza during travel depends on the time of year and destination. In the temperate regions of the Southern Hemisphere, influenza activity occurs typically during April–September. In temperate climate zones of the Northern and Southern Hemispheres, travelers also can be exposed to influenza during the summer, especially when traveling as part of large tourist groups (e.g., on cruise ships) that include persons from areas of the world in which influenza viruses are circulating. In the tropics, influenza occurs throughout the year. In a study among Swiss travelers to tropical and subtropical countries, influenza was the most frequently acquired vaccine-preventable disease.

Any traveler who wants to reduce the risk for influenza infection should consider influenza vaccination, preferably at least 2 weeks before departure. In particular, persons at high risk for complications of

influenza and who were not vaccinated with influenza vaccine during the preceding fall or winter should consider receiving influenza vaccine before travel if they plan to

- travel to the tropics,
- travel with organized tourist groups at any time of year, or
- travel to the Southern Hemisphere during April–September.

No information is available about the benefits of revaccinating persons before summer travel who already were vaccinated during the preceding fall. Persons at high risk who receive the previous season's vaccine before travel should be revaccinated with the current vaccine the following fall or winter. Persons at higher risk for influenza complications should consult with their health-care practitioner to discuss the risk for influenza or other travel-related diseases before embarking on travel during the summer.
http://www.cdc.gov/mmwr/preview/mmwrhtml/rr57e717a1.htm

Persons at higher risk who plan travel to the Southern Hemisphere may want to discuss with their health care provider whether taking prescription antiviral medication may be of benefit.

It may be difficult to obtain flu vaccine that is not outdated during summer months in the U.S. since most seasonal flu vaccines expire in June. Flu vaccine for the current circulating strains may not be available in the U.S. during the summer season of the Northern Hemisphere.

Is there *anyone* who should receive a second SEASONAL flu vaccine in the same flu season?

Children aged 6 months to 8 years of age who have never received the flu vaccine previously should receive 2 doses of the flu vaccine in the first flu season they are vaccinated. The second dose should be administered 4 or more weeks after receiving the initial flu vaccine. This applies to children ONLY, not adults. (NOTE: H1N1 flu vaccine will be given in two doses. This is a different flu vaccine than the seasonal flu vaccine.)

What about side effects? Can I get the influenza virus from getting the influenza vaccine?

You do not get influenza from the influenza vaccine. Most people will have no side effects from the vaccine. Some people may have coincidental respiratory illness around the time of receiving the influenza vaccine. This is not due to the influenza vaccine, but due to concurrent exposure to other respiratory illness.

Today's influenza vaccines cause fewer side effects than those used in the past. However, some minor side effects can occur: tenderness at the site of the shot may occur and last for several days. Some people (more likely to be people who have not received the influenza vaccine before or who have had no previous exposure to the influenza antigens in that season's influenza vaccine) may have low grade fever, chills, headache, malaise, or muscle aches within the first 48 hours. These reactions begin 6–12 hours after vaccination and can persist for one to two days. These symptoms are minor compared with influenza and the complications that can accompany influenza. Almost all people who receive influenza vaccine have no serious problems from it.

Does the seasonal influenza vaccine protect me from novel H1N1 influenza?

The 2009–2010 seasonal influenza vaccine will not protect against novel H1N1 influenza. However, experts believe it is very important to get the seasonal influenza vaccine in order to prevent additional influenza

viruses spreading or combining with the novel H1N1 influenza strain to create yet another novel strain of influenza.

Is there anyone who should *not* get the influenza vaccine?

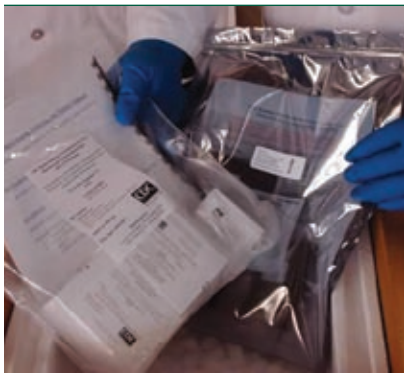
In some rare instances people receiving vaccine have had severe allergic reactions. The following precautions should be carefully noted:

- People with known *severe* allergy to chicken eggs should receive the vaccine only for specific indications under special medical supervision. Some people say they are allergic to eggs, yet they actually eat products made with eggs (e.g., bread, cake). Be sure the allergy to eggs is accurate information and not just personal food dislike/preference.
  - People with moderate or severe illness with a fever should delay getting vaccinated until the fever is gone.
  - People who have received another type of vaccine in the past 14 days should consult a health care provider before taking the influenza vaccine.
  - Influenza vaccine is not approved for children less than 6 months of age.
  - People who developed Guillain-Barré syndrome (GBS) within six weeks of getting an influenza vaccine previously should consult a physician first. (Note: At one time, influenza shots were made with live virus. Influenza shots are now made now made with killed/inactivated virus, so GBS as a side effect is extremely rare.)

LATEX

Are the flu vaccine formulations in the VA contract for 2009–2010 considered latex free (either the multi-dose vial flu vaccine manufactured by Novartis® or the prefilled syringe adult flu vaccine manufactured by CSLBiotherapies, Inc.®)?

YES. Both multi-dose vials and pre-filled syringe flu vaccines by the VA contract flu vaccine manufacturers are latex-free.



Is it safe to draw up the flu vaccine through the top of the multi-dose vials and to give the prefilled flu vaccine with rubber stopper to someone with Latex allergy? Are these Latex free as well?

YES. The "rubber" stoppers in these products are NOT made from natural rubber and do not contain latex. The packaging for the flu vaccines is latex free as well. It is safe to give either formulation of flu vaccine (multi-dose vial or pre-filled syringe) to persons with latex allergies.

THIMEROSAL: What is thimerosal?

Thimerosal is used as a preservative in some multi-dose vials of vaccines to reduce the likelihood of bacterial contamination. Preservatives are not required for vaccines in single-dose vials. As a preservative, thimerosal is added at the end of the production process to the bulk or final container to prevent contamination after multi-dose vials are opened. Until 1999, vaccines given to infants to protect them against diphtheria, tetanus, pertussis, *Haemophilus influenzae* type b (Hib), and hepatitis B contained thimerosal as a preservative. Today, with the exception of some influenza vaccines, none of the vaccines used in the United States to protect preschool-age children against 12 infectious

diseases contain thimerosal as a preservative. Thimerosal still may be used in the early stages of manufacturing of certain vaccines, but is removed through a purification process, with only trace, or insignificant, amounts remaining.

Can people who are allergic to thimerosal get the influenza vaccine?

Yes. The prefilled syringe adult formulation of VA contracted flu vaccine for the 2009–2010 season manufactured by CSL Biotherapies, Inc. is a preservative free formulation. It is considered thimerosal free. Thimerosal is removed by purification steps to a trace amount (≤ 1 mcg mercury per 0.5mL dose). The VA contracted flu vaccine products are safe to give to people who are allergic to thimerosal. (Source: Product specifications and information provided by CSL Biotherapies, Inc.)

When should we begin to vaccinate staff and patients for seasonal flu?

Seasonal flu vaccine should be administered as soon as vaccine supplies become available.

What about novel H1N1 flu vaccine? Will there be enough for VA staff?

There may be a need to determine prioritization to assist with the logistics of administering this vaccine. There will be special VA guidance documents concerning prioritization of H1N1 flu vaccine for VA staff. It is expected the novel H1N1 flu vaccine will be available in late fall 2009.

Does the seasonal flu vaccine provide protection for novel H1N1 flu?

No it does not. The seasonal flu vaccine does contain a H1N1-like virus, but it is not the same strain as the novel H1N1 flu virus that is causing the worldwide pandemic this year. Novel H1N1 flu contains a combination of genetic material of avian, human, and swine flu origin. There is a need for a separate, additional novel H1N1 flu vaccine because it is very different from the circulating seasonal H1N1 Influenza A virus. It is a *mutation* of four known strains of the *influenza A virus, subtype H1N1*: one normally infecting humans, one normally infecting birds, and two normally infecting swine (pigs). Experts assume the virus most likely emerged from pigs in Asia, and was carried to North America by infected persons.

What do The Joint Commission (TJC) 2009 National Patient Safety Goals state about influenza vaccine?

"Reduce the risk of influenza and pneumococcal disease in institutionalized older adults.

- The organization develops and implements protocols for administration of the flu vaccine.
- The organization develops and implements protocols for administration of the pneumococcus vaccine.
- The organization develops and implements protocols to identify new cases of influenza and to manage outbreaks."

Do people who receive the flu vaccine need to wait 15 minutes before leaving the area to be sure they do not have side effects?

It is a good idea and we encourage flu vaccine recipients to do so, if at all possible. The recommendation below is probably MORE important for those patients who have had previous problems following a vaccination. Some patients are chronic "fainters," and should be encouraged to wait in a safe location after treatment. They usually know who they are! Those receiving a vaccination for the first time should also be encouraged to wait nearby in a safe location for 15 minutes as a precautionary measure.

The advice from http://www.cdc.gov/mmwr/preview/mmwrhtml/rr5515a1.htm (General Recommendations) is:

"Syncope (vasovagal or vasodepressor reaction) can occur after vaccination, most commonly among adolescents and young adults. During 1990–2004, a total of 3,168 reports to Vaccine Adverse Event Reporting System (VAERS) were coded as syncope; 35% of these episodes were reported among persons aged 10–18 years (CDC, unpublished data, 2005). Approximately 14% of reported syncopal episodes resulted in hospitalization because of injury or medical evaluation. Serious injury, including skull fracture and cerebral hemorrhage, has resulted from syncopal episodes after vaccination. A review of syncope after vaccination indicated that 63% of syncopal episodes occurred ≤5 minutes after vaccination, and 89% occurred within 15 minutes after vaccination. Although syncopal episodes are uncommon and severe allergic reactions are rare, vaccine providers should strongly consider observing patients for 15 minutes after they are vaccinated. If syncope develops, patients should be observed until the symptoms resolve."

For drive-through flu vaccine clinics: Be sure to plan for an area where the vehicle can pull forward and wait 15 minutes after the enrolled Veteran receives the flu vaccine and to instruct the flu vaccine recipient to wait 15 minutes before continuing on in the vehicle (even if the flu vaccine recipient is a passenger in the vehicle, not the driver).

How do I report an adverse reaction from flu vaccination?

Providers report the adverse event through the Adverse Event Tracking Package (ART) in CPRS and also through the VA Adverse Drug Event System (VA ADERS). Providers have direct access to CPRS. The Chief of Pharmacy (or designee) at every facility inputs adverse reactions into VA ADERS for drugs and vaccines. A Vaccine Adverse Event Reporting System (VAERS) form for all vaccines should be submitted anytime an adverse event occurs. Occupational health should also use this reporting structure. The VAERS form is available at http://vaers.hhs.gov/pdf/vaers_form.pdf. On-line reporting is available at https://secure.vaers.org/

What else (besides vaccine) can one do to protect oneself and others from influenza illness?

- Cover your nose and mouth with a tissue when you cough or sneeze, and dispose of the tissue afterward.
- If you do not have a tissue, cough or sneeze into your sleeve.
- Clean your hands after you cough or sneeze with soap and warm water or an alcohol-based hand cleaner, even if your hands are not visibly soiled.
- Educate yourself and others. This VA Web site includes posters, information, and links about hand and respiratory hygiene: http://www.publichealth.va.gov/InfectionDontPassItOn/
- If you get sick from the influenza virus, avoid exposing others. Stay home from work or school until your fever is gone and you feel ready to resume normal activities.
- Get the pneumococcal vaccine if you're age 65 or older or have a chronic health condition. (See the Pneumococcal Vaccine Information Statement, Appendix C in this document.)

2. Employees, Trainees, Volunteers, and Seasonal Influenza Vaccine

For additional information, also see Frequently Asked Questions on Influenza Vaccination for Occupational Health in Section II: "How to Improve Vaccination Rates in VHA Employees, Trainees, and Volunteers"

Influenza is spread primarily by droplets in the air that can travel about three feet. If an employee or volunteer has the influenza virus and comes within three feet of a patient, the influenza virus can be transmitted to the patient. If the infected worker coughs or sneezes, the influenza virus droplets can be propelled beyond three feet.

Should we vaccinate volunteers as part of our campaign?

Yes. Volunteers provide a vital service to our Veterans including the provision of direct patient care. Facilities should offer the influenza vaccine to volunteers.

Should we offer the influenza vaccine to medical residents and other trainees who provide services at the VA during the influenza season through our Occupational Health Department?

The decision with regard to resident and other trainees is an individual VA facility decision; it should take into account the contractual agreement with academic affiliates, the availability of the vaccine, and the potential benefit to the VA. Facilities may want to make the same decisions about providing the influenza vaccine for rotating or temporary trainees (e.g., house staff/medical residents) as they do for volunteers.

Should employees, trainees, and volunteers who have contact with HIV/AIDS patients and other patients with compromised immune systems be vaccinated?

All employees, trainees, and volunteers in health care settings should receive annual influenza vaccination unless they have a contraindication to the vaccine.

What are the recommendations for vaccination of employees, trainees, and volunteers against influenza?

All employees, trainees, and volunteers in health care settings should receive annual influenza vaccination unless they have a medical contraindication to the vaccine.

Why is vaccination recommended for employees, trainees, and volunteers?

- They can give influenza to patients, coworkers, family members, and others.
- They are at risk of getting influenza from patients with influenza.
- Preventing influenza through annual vaccination keeps employees, trainees, and volunteers healthy and available to come to work or to take care of patients.
- Inactivated influenza vaccine (the flu shot) is the preferred vaccine for people coming into close contact with anyone who has a severely weakened immune system.

What are the recommendations for use of declination form for employees, trainees, and volunteers against influenza?

VHA *does not* have a national mandate requiring the use of declination forms.

How do I report an adverse reaction from flu vaccination?

Providers report the adverse event through the Adverse Event Tracking Package (ART) in CPRS and also through the VA Adverse Drug Event System (VA ADERS). Providers have direct access to CPRS. The Chief of Pharmacy (or designee) at every facility inputs adverse reactions into VA ADERS for drugs and vaccines. A Vaccine Adverse Event Reporting System (VAERS) form for all vaccines should be submitted anytime an adverse event occurs. Occupational health should also use this reporting structure. The VAERS form is available at http://vaers.hhs.gov/pdf/vaers_form.pdf. On-line reporting is available at https://secure.vaers.org/

Is LAIV an option for employees, trainees, and volunteers?

Yes, LAIV is an option for healthy employees, trainees, and volunteers up through age 49, especially when there is a shortage of inactivated influenza vaccine. Choosing LAIV, currently available as FluMist®, means you are helping to conserve when there is limited inactivated influenza vaccine for high-risk persons who do not have the option of live attenuated influenza vaccine. It is also a good option for employees, trainees, and volunteers who may not get the vaccine because they are afraid of needles.

Is shedding the virus a problem for employees, trainees, and volunteers?

The FluMist® package insert states that a person can shed the virus for up to three weeks because that is what the studies in humans showed, but shedding alone should not be equated with person-to-person transmission. In fact, studies have found that person-to-person transmission caused by shedding is very rare. In a study conducted in a Finnish day care center that was designed to maximize the chance of detecting vaccine virus transmission, one child shed the virus for 21 days. Other children in this study shed the virus a mean of 7.6 days. Estimated transmission rates were extremely low (0.6–2.4 percent). There was actually only one documented case of LAIV transmission. An additional small study of 40 adults conducted since licensure found that only 50 percent of the adults were shedding the vaccine influenza virus on day three after vaccination; one adult shed the virus on day seven. That means that half the adults had stopped shedding the virus by day three. These post licensure studies prompted the Advisory Committee on Immunization Practices (ACIP), an independent committee that advises the CDC, to reduce the recommended number of days an employee or volunteer should avoid contact with patients requiring protective isolation from three weeks to seven days.

Should employees, trainees, or volunteers who have a contraindication to LAIV administer it?

They can. Environmental contamination with LAIV during administration is probably unavoidable. However, because it is an attenuated virus (weakened) that is designed not to replicate at the warm temperatures of the lower respiratory tract, the ACIP does not believe that administration of LAIV by a person with one of the contraindications to it (like asthma, chronic obstructive pulmonary disease, etc.) puts that person at risk from infection or illness from the vaccine virus.

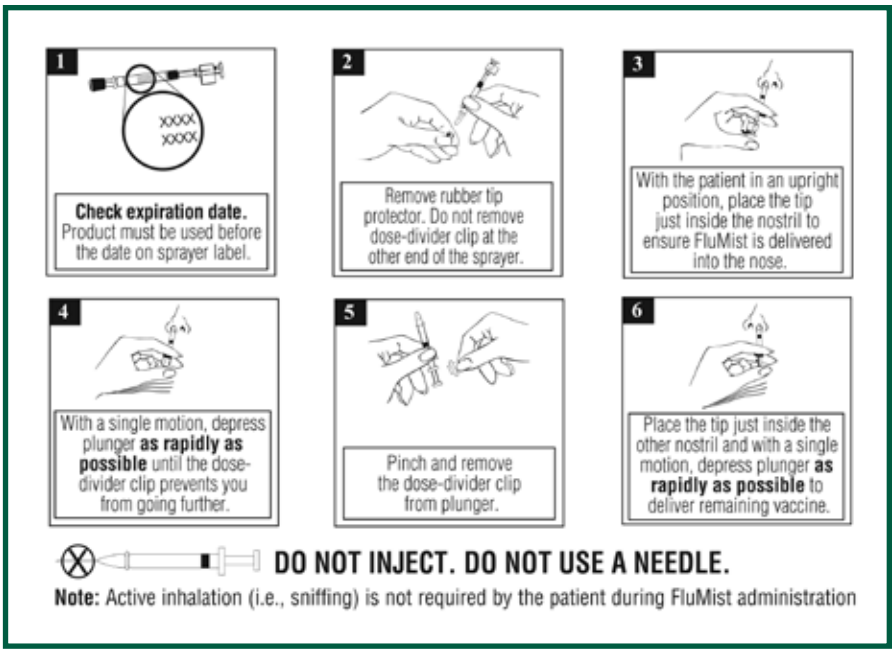
3. Live, Attenuated Intranasal Influenza Vaccine (LAIV or FluMist®)

For additional information, also see Frequently Asked Questions on Influenza Vaccination for Occupational Health in Section II: "How to Improve Vaccination Rates in VHA Employees, Trainees, and Volunteers"

Is LAIV a safe vaccine?

Yes. LAIV is indicated for specific groups of people who are " healthy" and who do not have direct contact with people with severe immune system problems.

The development of the live, attenuated influenza vaccine has been ongoing since the 1960s. Prior to licensure, the safety of LAIV was studied in 20 clinical trials. More than 6,000 clinical trial participants were in the approved age range of 5 to 49 years. In healthy children there were no significant differences between vaccine and placebo recipients. Serious adverse reactions have been identified in less than one percent of LAIV recipients, either children or adults, since licensure.



Who should get the LAIV (nasal spray) flu vaccine (for their seasonal flu vaccine, rather than by injection route?

On October 24, 2007, CDC's Advisory Committee on Immunization Practices (ACIP) recommended expanding the use of LAIV to include healthy children ages 2–4 years old (24–59 months old) without a history of asthma or recurrent wheezing. The vaccine continues to be recommended for healthy persons ages 5–49 years who are not pregnant. "Healthy" indicates persons who do not have an underlying medical condition that predisposes them to influenza complications.

Do we give LAIV to VA employees or enrolled Veterans?

At this time, the VA does not have a specific contract for purchasing LAIV for our seasonal flu vaccine programs. Individual facilities may choose to order and administer this type of flu vaccine for specific recommended groups. The use needs to be according to the current CDC ACIP guidelines. The ordering and administration of this formulation of flu vaccine would be coordinated through your Pharmacy and Flu Vaccine committee.

The novel H1N1 flu vaccine may also be available as a nasal spray. It is not known at the time of this publication if VA will provide the novel H1N1 flu vaccine in the nasal spray formulation in addition to injectable novel H1N1 flu vaccine.

How is LAIV given?

Approximately 0.1 mL (i.e., half of the dose from a single FluMist® sprayer) is administered into each nostril while the recipient is in an upright position. The tip of the sprayer is inserted just inside the nose and the plunger rapidly depressed until the dose-divider clip stops its motion. The dose-divider clip is removed from the sprayer to administer the second half of the dose (approximately 0.1 mL) into the other nostril. Once FluMist® has been administered, the sprayer should be disposed of according to the standard procedures for medical waste.

4. Influenza Antiviral Agents

See Appendix E and F for prescribing and dosage information.

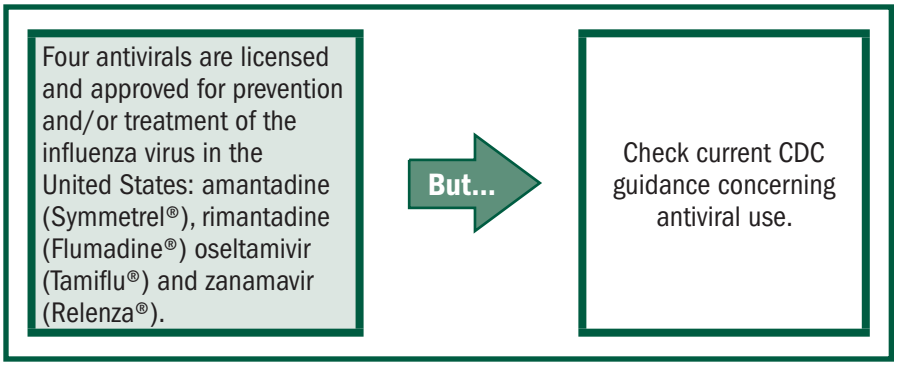
What are influenza antiviral medications?

Antiviral medications are an adjunct to influenza vaccine for preventing the spread and controlling influenza. They work to prevent the influenza virus from replicating (reproducing) or making more copies of the influenza virus in the body. ***These agents are not a substitute for receiving the influenza vaccine each year.***

How do influenza antiviral agents work?

They work by preventing the influenza virus from replicating (reproducing) or from making more copies of the influenza virus in the body.

How do the influenza antiviral agents differ? Do they work against both influenza A and B?



On June 25, 2009, the US Centers for Disease Control and Prevention (CDC) at the Advisory Committee on Immunization Practices meeting in Atlanta issued updated guidelines for treatment of influenza, including novel H1N1, suggesting basing antiviral selection on laboratory test results when possible. The new guidance appears to be aimed at preventing the inadvertent prescription of oseltamivir (Tamiflu) for seasonal H1N1 infections, which have shown extensive resistance to oseltamivir in the United States and other parts of the world.

According to the CDC update, only patients who test positive for influenza A/H3N2, pandemic H1N1, or B should receive oseltamivir. Zanamivir (Relenza) is preferred for patients who test positive for seasonal H1N1 influenza. If a laboratory test is not performed or the test is negative but clinical suspicion remains, the preferred treatment is zanamivir or a combination of oseltamivir and rimantadine, which is an older drug of the adamantine class of antivirals. If testing indicates influenza A or unspecified influenza, the preferred treatment is also zanamivir or a combination of oseltamivir and rimantadine. As with its earlier recommendation for novel H1N1 treatment, the

CDC emphasized that treatment should be started as soon as possible after illness onset. The CDC added a few more specifics to the list of people for whom antiviral treatment should be considered to include those who are hospitalized with influenza, have influenza with viral or bacterial pneumonia, or have influenza with a higher risk for complications, regardless or illness severity.

- **Amantadine** (Symmetrel®), **rimantidine** (Flumadine®) are chemically related antiviral drugs known as adamantanes. They have known effect against influenza A viruses, but **not** influenza B viruses. During the 2005–2006 influenza season, the prevalent influenza strains in the United States were resistant to amantadine and rimantidine. The CDC updated recommendations for antiviral therapy for influenza in January 2006 due to this development.
- **Oseltamivir** (Tamiflu®) and **zanamivir** (Relenza®) may be prescribed if antiviral treatment or chemoprophylaxis of influenza is indicated (see Appendix F for additional information concerning use of Antiviral Agents for Influenza).
- **Oseltamivir** (Tamiflu®) and **zanamivir** (Relenza®) are chemically related antiviral drugs known as neuraminidase inhibitors with known effect against *both* influenza A and B viruses. Both are approved for treating uncomplicated influenza infections. Oseltamavir is approved for treatment and chemoprophylaxis (prevention) of influenza A and B in people ≥ 1 year of age. Zanamivir is approved for treatment and chemoprophylaxis of influenza A and B in people ≥ 5 years of age.
- **Oseltamivir** (Tamiflu®) is administered orally in tablet form. **Zanamivir** (Relenza®) is administered by an inhaler. **Zanamivir** (Relenza®) is contraindicated for some people with breathing problems such as asthma or chronic obstructive pulmonary disease and other serious medical problems

Oseltamivir (Tamiflu®) should be used alone only if recent local surveillance data indicate that circulating viruses are likely to be influenza A (H3N2) or influenza B viruses. Recommendations for use of antivirals may change as data on antiviral effectiveness, clinical spectrum of illness, adverse events from antiviral use, and antiviral susceptibility data become available. For current information, visit http://www.cdc.gov/flu/professionals/antivirals/index.htm

such as heart disease. A possible side effect is bronchospasm. Zanamivir is recommended as first-line flu antiviral for pregnant women, although both antivirals are acceptable for use with pregnant women.It is VERY important that patients take antiviral medications as prescribed, for the duration of treatment.

What else do I need to know about influenza antiviral medications?

- Check for updated reports from the CDC concerning the appropriate antiviral medications to use for the influenza strains in the 2009–2010 seasonal influenza season (www.cdc.gov). Use of antiviral medications may be limited to treatment of the sickest people, rather than all who have H1N1 flu. In addition, antiviral medications may be given primarily for treatment and only as prophylactic (preventative) measures in special populations.
- Antiviral medications are most often used to help contain influenza outbreaks in settings such as nursing homes, or to protect a high-risk person who is in direct contact with someone who has influenza.
- Antiviral treatment for people who have the influenza virus lasts for five days and *must be started within two days of illness*. Therefore, people who get flu-like symptoms should seek medical care early.
- To be effective, antivirals should be taken within 24 to 48 hours of being exposed to influenza or onset of symptoms.
- Employees and volunteers working in nursing homes with influenza cases may be on antiviral medications longer than five days (up to 14 days), as *preventive treatment* in response to an outbreak or case of influenza in the nursing home. Check the CDC Web site: www.cdc.gov/flu for current treatment guidelines.
- A supply of oseltamivir and zanamivir is maintained in a national VA stockpile for pandemic flu.
- There are some risks in taking antivirals. A few people have serious side effects from them.
- Oseltamivir-resistant influenza A (H1N1) strains have been identified in the United States and other countries, but oseltamivir and zanamivir continue to be the recommended antivirals for treatment of influenza since resistance to other influenza antivirals (i.e., amantadine and ramantidine) remains high.

To be effective, antivirals should be taken within 24 to 48 hours of being exposed to influenza or onset of symptoms.

Can I give LAIV influenza vaccine with influenza antiviral medications?

The effect on safety and effectiveness of LAIV coadministration with antivirals has not been studied. However, because influenza antivirals reduce replication of influenza viruses, LAIV should not be administered until 48 hours after cessation of influenza antiviral therapy, and influenza antiviral medications should not be administered for two weeks after receipt of LAIV.

Can I give inactivated influenza vaccine injection (the flu shot) with influenza antiviral medications?

Yes. It contains only influenza virus subunits and no live virus, no contraindication exists to the co-administration of the flu shot and influenza antivirals.

Is it safe to give influenza antiviral medications to people who have immune deficiencies, such as HIV or advanced HIV disease?

Chemoprophylaxis can be considered for persons at high risk who are expected to have an inadequate antibody response to influenza vaccine. This category includes persons infected with HIV, especially those with advanced HIV disease. No published

data are available concerning possible efficacy of chemoprophylaxis among persons with HIV infection or interactions with other drugs used to manage HIV infection. These persons should be monitored closely if chemoprophylaxis is administered.

5. Eligibility for Seasonal Influenza Vaccination in VA

For additional information concerning volunteers, medical residents, etc., also see Frequently Asked Questions on Influenza Vaccination for Occupational Health in Section II: "How to Improve Vaccination Rates in VHA Employees, Trainees, and Volunteers"

Many wives and children of selected Veterans are eligible for CHAMPVA (Civilian Health and Medical Program of the Department of Veterans Affairs) and use VA medical facilities for their care. Where the VAMC sees CHAMPVA beneficiaries, are they eligible for vaccinations if they meet criteria for the vaccine?

Yes, CHAMPVA beneficiaries and beneficiaries under the Spina Bifida Health Care Program who are seen in a VAMC may be provided the vaccination if they meet the criteria. VAMCs can be reimbursed for this service through the VA Health Administration Center (HAC). VAMC's CHAMPVA In House Treatment Initiative (CITI) Coordinators can provide specifics on how to bill the HAC.

Can we give flu vaccine to family members of enrolled Veterans?

No. At this time, flu vaccine purchased by the VA may not be given to family members of enrolled Veterans. (Please see information above concerning CHAMPVA members and their eligibility.)

Some VA facilities have partnered with local public health agencies in order to offer flu vaccine to family members and those not enrolled for VA care during flu vaccine campaigns. The local public agencies *provide their own supply of flu vaccine,* records, and billing or cost accounting (i.e., billing Medicare or insurance). The local public health agency (i.e., "Visiting Nurse Association" or local county health department) provides its' own staff to administer flu vaccines as well. The local public health agency may be available at a separate station/location within the VA facility during walk-in flu vaccine campaigns, for example.

Can we give seasonal flu vaccinations to non-VA federal staff?

No, we do NOT generally offer seasonal flu vaccination to non-VA staff or anyone not enrolled within the VA health care system. However, it is anticipated the VA facilities will assist with administering the novel H1N1 flu vaccine to non-VA federal staff. It will be very important to plan carefully: to clearly document administration of this vaccine in order to provide accurate data concerning vaccination numbers in VA and non-VA federal staff, to track flu vaccine lot numbers and supply, and to plan logistics.

Can Veterans who are not currently enrolled in VA health care receive flu vaccine? If so, what is the proper procedure for processing such requests.

As long as a supply of vaccine is available, vaccine may be provided to any enrolled Veteran. Veterans who are not enrolled may apply for enrollment. If Veterans meet current requirements for enrollment they may be provided flu vaccine. Guidelines for administrating flu vaccine may be found in the Under Secretary for Health's Annual Influenza Directive or by a current Influenza Vaccine Advisory. These documents are posted on the Internet and may be found at: http://www.publichealth.va.gov/flu/

State Soldiers Homes and Community Living Centers (Nursing Homes) that house VA patients are requesting influenza vaccine from us. It is difficult to control the supply in these locations; especially in community living centers where there are only a few VA patients.

Generally VA only provides medications, including flu vaccine, to State Soldiers Homes' supplies when a VA facility has established a contract to provide such services. Unless a VA facility has an agreement to vaccinate enrolled Veterans residing in a State Soldiers Home or Community Living Center (Nursing Home), patients must visit a VA facility to receive their flu vaccine. The State Soldiers Home or Community Living Center (Nursing Home) administrator should provide names and social security numbers of enrolled Veterans residing in their facility to VA so VA can verify eligibility, assure adequate vaccine supply, and coordinate plans for providing flu vaccine to this Veteran population. It is very important to document the receipt of flu vaccine at locations outside the VA facility. This needs to be recorded in the enrolled Veteran's CPRS health record in order to satisfy (turn off) the CPRS Clinical Reminder for flu vaccine and prevent giving the enrolled Veteran an unnecessary second flu vaccine when he/she presents for health care at a VA facility.

Is VA mandated to provide vaccine for employees in Soldier's Homes and Community Living Centers (Nursing Homes)?

VA is **not** mandated to provide flu vaccine to state Soldiers Homes or Community Living Centers (Nursing Homes). VA may provide flu vaccine if an existing contract has been negotiated for VA to supply such medication to the state Soldiers Home or Community Living Center (Nursing Home) the State Home whether to be used for its residents or employees.

Are Homeless Veterans who attend stand-downs eligible for influenza vaccine?

Influenza vaccine given by VA is for Veterans who are enrolled for VA health care and who meet current tiered vaccination timing plans (if any). VA staff should have access to validation records (i.e., VistA) to facilitate determination of enrollment status. A very large percentage of homeless Veterans are likely to have qualifying medical conditions that meet CDC criteria.

6. HIV/AIDS and Seasonal Influenza Vaccination

Are there people with HIV/AIDS who should NOT receive influenza shots?

Contraindications to the use of the influenza vaccine in persons with HIV/AIDS are the same as those for uninfected persons: a history of severe allergy (i.e., anaphylactic allergic reaction) to hens' eggs, or a history of onset of Guillain-Barre' syndrome during the six weeks after vaccination.

Can people with HIV/AIDS receive the live attenuated influenza vaccine (LAIV), sold commercially as FluMist®?

No. Persons with HIV/AIDS are not recommended to receive the live influenza vaccine. LAIV is approved for use only among healthy persons between the ages of 5 and 49 years and healthy children aged 2–4 years who do not have a history of wheezing or asthma.

When should people with HIV/AIDS be prescribed antiviral medications for chemoprophylaxis (prevention)?

Persons with advanced HIV disease may have difficulty developing the desired immune response from the influenza vaccine. Therefore, chemoprophylaxis (use of influenza antiviral medications for prevention) should also be considered for these

patients if they are likely to be exposed to people with influenza; e.g., when a family or household member is diagnosed with influenza, the exposed person with HIV/AIDS should be given chemoprophylaxis.

- People with advanced HIV disease who are not expected to mount an adequate antibody response to influenza vaccination should be considered for chemoprophylaxis with influenza antiviral medications for the duration of influenza activity in the community, if antiviral medications are available in adequate supply. Check current CDC guidelines for influenza antiviral treatment of persons with HIV at www.cdc.gov/flu.
- Vaccinated and unvaccinated HIV-infected persons who are residents of institutions experiencing an influenza outbreak should be given chemoprophylaxis for the duration of the outbreak or until discharge.

Should employees, trainees, and volunteers who have contact with HIV/AIDS patients receive the flu vaccine?

Definitely!

Can patients undergoing chemotherapy for cancer receive the flu vaccine?

http://www.cdc.gov/vaccines/recs/vac-admin/downloads/contraindications_guide.pdf

CDC does not list immunosuppressive therapy as a contraindication (or precaution) for TIV—only for LAIV (live virus vaccine—there's a "2 week" warning on that one).

If one anticipates that the patient will be neutropenic within 2 weeks of vaccination, one can still vaccinate but consider anti-viral medication (oseltamivir) also if there is a likelihood of exposure. Call one's local health department for the most current information on influenza disease in the community, as the CDC's map information is about 2 weeks old when it goes online.

It's best to have the vaccine on board two weeks before becoming neutropenic. Another, VERY IMPORTANT piece of advice: teach the patient's family that they can protect the patient by ensuring that THEY all are vaccinated, especially the little ones in the family.

7. Special Considerations for Pregnant Women

What special things do I need to know about the influenza virus and pregnant women?

Pregnant women are at increased risk for influenza-related complications and hospitalizations.

Should pregnant women get the influenza vaccine?

YES. Women who are pregnant or plan to become pregnant during the influenza season should be vaccinated against influenza. They should receive only inactivated influenza vaccine (influenza vaccine by injection). Inactivated influenza vaccine may be administered in any trimester.

Check for other conditions that might require additional medical evaluation for the flu vaccine for all persons, regardless if pregnant or not. (See *General Questions* of this section under, "*Is there anyone who should* ***not*** *get the influenza vaccine?")*

Should pregnant women get the live attenuated intranasal influenza vaccine (LAIV), intranasal spray, as their seasonal influenza vaccine?

No. Pregnant women should receive the inactivated influenza vaccine by injection; not the LAIV intranasal spray route. Check for other conditions that might require additional medical evaluation for the influenza vaccine for all persons, regardless if pregnant or not.

Can pregnant employees administer the LAIV intranasal spray to patients?

Yes.

Can influenza antiviral drugs be used in pregnant women?

Antiviral drugs are "Pregnancy Category C" medications, indicating that no studies have been conducted to assess the safety of these drugs for pregnant women. No safety problems have been identified for use of these medications for pregnant women However, because of the unknown effects of these drugs on pregnant women and infants who were exposed before birth, these drugs should be used during pregnancy only if the potential benefit justifies the potential risk to the unborn child. Physicians considering using one of these drugs in a pregnant woman should consult that drug package insert.

Can breastfeeding mothers get the influenza vaccine?

Yes. Inactivated influenza vaccine is safe for mothers who are breastfeeding and their infants. However, because excretion of LAIV in human milk is unknown and because of the possibility of shedding vaccine virus given the close proximity of a nursing mother and her infant, caution should be exercised if LAIV is administered to nursing mothers. Breastfeeding does not adversely affect the immune response and is not a contraindication for vaccination.

8. Influenza Vaccine Storage and Prefilled Syringes

See additional information on "Inactivated Influenza Vaccine Administration" and "Live Attenuated Influenza Vaccine Administration" in Appendix A.

Would prefilling syringes of influenza vaccine from a multidose vial and leaving them out of the refrigerator for use during high volume vaccination efforts affect the potency of the vaccine?

There is no known data on vaccine stability once the vaccine is drawn from a multidose vial. When creating "pre-filled" syringes, consider the following:

- Be sure to vigorously shake a multidose vial before drawing up influenza vaccine (as recommended by influenza vaccine manufacturers).
- Be sure to maintain the temperature of syringes/vaccine at 35º to 46º F (2º to 8º C) via use of an insulated container; check the temperature with a thermometer. Do not place directly on ice or ice packs due to risk of freezing the vaccine.
- Do not store in the door of the refrigerator. Place in the center of refrigerator for consistent temperature exposure. Check the temperature of the refrigerator twice a day.
- Do not freeze or expose vaccine to freezing temperatures. Trivalent inactivated vaccine (TIV)/injectable formulation that has been frozen should be discarded.
- Do not prefill a large number of syringes from a multi-dose vial due to:
  - Increased risk for administration errors.
  - Chance of wasting vaccine.
  - Risk of inappropriate storage conditions.
  - Potential for bacterial overgrowth in vaccines that do not contain a preservative.
  - Reduced vaccine potency.
- Prefill the smallest logical number of syringes, according to your patient flow.
- Try to fill no more than ten prefilled syringes at a time (one multi-dose vial) per person vaccinating.

- Discard any prefilled syringes remaining at the end of the clinic session.
- Mark the container of prefilled syringes with the date and time of filling.
- Label each prefilled syringe with medication and dose. The date does not need to be on the label since the vaccine should be administered shortly after withdrawal from the vial, due to concerns about length of time vaccine would be stable.
- In setting up a mass vaccination clinic
  - Administer only one type of vaccine per station (keep influenza and pneumococcal vaccines separate).
  - Transport the vaccine to the clinic in the manufacturer-supplied packaging at the recommended temperatures.
  - Keep vaccine vials and prefilled syringes in a cooler (but not in direct contact with ice).

What about storage and handling of prefilled influenza vaccine in glass syringes supplied by the influenza vaccine manufacturer?

Vaccine that is packaged in prefilled glass syringes by the manufacturer should be kept at the same storage temperatures as the multi-dose vial preparation and handled in the same manner.

How is LAIV intranasal vaccine stored?

LAIV vaccine will be shipped frozen but should be stored in a refrigerator at 2°C to 8°C (35°F to 46°F) when received. Keep the vaccine refrigerated. Vaccine is good for use up to the expiration date. Do not refreeze the vaccine. Check with manufacturer instructions for confirmation or call: 1-877-FLUMIST (358-6478). Additional information regarding LAIV storage is available at http://www.FluMist.com.

9. Pandemic or Novel Influenza A (H1N1)

For more information on this topic see www.flu.gov.

What is the difference between regular (seasonal) influenza that is around every year and novel pandemic influenza?

Influenza virus circulates in humans every year, usually in winter. Several times each century, a strain that is new to humans originates from the re-assortment of human and animal strains. These new or novel strains cause pandemics that can be very serious, because humans have little

Emergency Hospital during 1918 influenza epidemic; Camp Funston, Kansas

pre-existing immunity to them and vaccines and antiviral medications take time to develop, supply, and distribute.

The novel H1N1 flu virus differs from the usual circulating strain of H1N1 flu with unique genetic sequences from swine.

The 1918–1919 pandemic caused as many as 500,000 deaths in the United States and 50 million globally. Public health experts around the world and within VA have been preparing for a pandemic of novel influenza for many years.

10. Medication Reconciliation

Is medication reconciliation necessary for flu vaccinations given to enrolled Veterans or employees? Is it required to have a physician order for flu vaccine in each individual's record?

It is The Joint Commission's position that medication reconciliation is required whenever the *live* vaccine (LAIV intranasal spray) is used, but it is left to the provider organization to decide whether to gather a list of the patient's (employee's) current medications and review prior to administering *inactivated* flu vaccine (flu vaccine injection/shot). If the organization's decision is not to do this, then each person receiving the flu vaccine must be provided information about the risks of vaccination and encouraged to share any relevant information prior to receiving the flu vaccine. Note that Federal law requires that a Vaccine Information Statement (VIS) be provided to the person prior to administering a dose of the flu vaccine. For more information on this requirement, please visit http://www.cdc.gov/nip/publications/VIS/vis-facts.htm

The rationale for requiring medication reconciliation for the *live* flu vaccination (LAIV) is the potential for drug interactions with the live flu vaccine; patients receiving immunosuppressive therapy should not receive the *live* flu vaccine (LAIV). The inactivated flu vaccine (injection) is used most extensively. For the inactivated flu vaccine, there is no real contraindication to using it based on potential drug interactions. Some clinicians still recommend screening for anticoagulant therapy (i.e., warfarin) since the inactivated flu vaccine is administered intramuscularly. (Source: FAQs for The Joint Commission's 2008 National Patient Safety Goals, updated 3/08) http://www.jointcommission.org/NR/rdonlyres/9ECF1ED6-E04E-41DE-B7BC-174590CEDF33/0/07_NPSG_FAQs_8.pdf

Flu vaccinations may be ordered by protocol, rather than an individual physician order in each individual patient/employee record. A protocol order for flu vaccination may be written in a memorandum. Physician orders for flu vaccination may also be written in individual patient/employee records . Standing orders programs (flu vaccinations ordered by protocol) ensure that flu vaccinations are offered. Standing orders programs for influenza vaccination should be conducted under the supervision of a licensed practitioner according to a physician-approved facility or agency policy by health care professionals who are trained to screen patients for contraindications to vaccination, administer vaccine, and monitor for adverse events.

Section VII

Appendices

Appendix A: How to Administer Influenza Vaccines

Inactivated Influenza Vaccine Administration

1. **Provide the vaccine recipient with the appropriate CDC Vaccine Information Statement (VIS).** This must be a print copy that the patient may read and take home. A copy of the CDC influenza VISs are included in Section 2 of this manual or on the Web at http://www.cdc.gov/vaccines/pubs/vis/default.htm VA staff may also provide patients with other information or educational material in addition to the CDC VIS.
2. **Ensure the patient has no known contraindications to receive the vaccine.** In some rare instances people receiving vaccine have had severe allergic reactions. The following precautions should be carefully noted:
   - People with known *severe* allergy to eggs, SHOULD NOT receive the vaccine unless evaluated by their physician to help determine if vaccine should be administered. People may say they are allergic to eggs, yet they actually eat products made with eggs (e.g., bread, cake). Be sure the allergy to eggs is accurate information and not just personal food dislike/preference.
   - People who have had a previous influenza vaccination and had a serious reaction to components of the vaccine.
   - People with moderate or severe illness with a fever should delay getting vaccinated until the fever is gone.
   - Influenza vaccine is not approved for children less than 6 months of age.
   - People who developed Guillain-Barré syndrome (GBS) within six weeks of getting an influenza vaccine previously should consult a physician first. (Note: At one time, influenza shots were made with live virus. Influenza shots are now made with killed/inactivated virus, so GBS as a side effect is extremely rare.)
3. **Administer the vaccine properly.**
   - **Clean or decontaminate your hands.**
   - **Examine and prepare the vaccine:** Always double check the vial label to make sure that you have the vaccine you want to administer. Shake the vial and visually inspect it for particulate matter. If you cannot shake the vaccine into a relatively even suspension, do not use it. After wiping the rubber stopper with an alcohol swab, load the syringe by injecting air into the vial, the same volume of air as the dose of vaccine to be drawn, pull plunger and draw vaccine into syringe. **Pre-filled syringes** should be shaken well before administration.
   - **Site and route of administration:** Inactivated influenza vaccines are administered intramuscularly (IM). In adults, IM injections should be injected deep directly into the deltoid muscle, below the shoulder on the upper arm.

Inactivated influenza vaccine should never be frozen. Store between 2–8° C (35–46° F). Refrigerator temp should be checked 2 x daily.

- **Proper needle gauge and length:** The proper needle length for adult IM injections is a 1"–1 1/2" 22–25 gauge needle for average sized adults. Smaller adults (less than 130 lbs) may require a 5/8" needle but needle length must be able to ensure sufficient intramuscular injection.
- **Proper documentation of influenza vaccination:** It is important to keep organized and accurate vaccination records. (For employee and volunteer vaccination, see Section 3, and for patients see Section 7.)
- **Different types of inactivated vaccines** may be given at the same time and be effective in developing immunity.

4. **Safely dispose of the needle and syringe.** Use a safety needle product and activate the safety mechanism before discarding syringe with needle into the sharps container. If a non-safety needle must be used, do not recap the needle after use. Discard the uncapped used needle and syringe into a sharps container keeping your eyes on the needle continuously until it is inside the container.
5. **Prepare and watch for an allergic reaction (anaphylaxis).** Acute anaphylactic reactions are very rare, occurring after approximately one out of every 500,000 doses of vaccine. When they occur, however, you must take immediate action. No vaccine should ever be administered unless epinephrine, diphenhydramine, adult airways, and blood pressure cuffs are on hand. Employees and volunteers should be familiar with an anaphylaxis protocol and with cardiopulmonary resuscitation (CPR).

   After you have administered a vaccine to the vaccine recipient, instruct the recipient to report any itching, redness (with or without hives), difficulty breathing, or abdominal pain within several minutes of injection. Having the vaccine recipient wait 15 minutes in a post-injection area is suggested but is not officially required.

Note:
Inactivated influenza vaccine MUST be administered intramuscularly. A 1"–1 1/2" 22–25 gauge needle is recommended for the average sized adult.

Content adapted from (1) "Adults Only Vaccination: A Step-By-Step Guide," Immunization Action Coalition (IAC), 2004, and from "Influenza Virus Vaccine: Fluzone® (Aventis Pasteur Inc.) (2) Influenza Virus Vaccine: Fluarix® (GlaxoSmithKline Vaccines) (3) Prevention and Control of Influenza: Recommendations of the Advisory Committee on Immunization Practices (ACIP), MMWR, June 28, 2006. Vol. 55. Available at http://www.cdc.gov/mmwr/preview/mmwrhtml/rr55e628a1.htm *(4) General Recommendations on Immunization Recommendations of the Advisory Committee on Immunization Practices (ACIP), MMWR, December 1, 2006, Vol 55 available at* http://www.dcd.gov/mmwr/preview/mmwrhtml/rr5515al.htm

Live Attenuated Influenza Vaccine Administration

1. **Provide the vaccine recipient with the appropriate CDC Vaccine Information Statement (VIS).** This must be a print copy that the patient may read and take home. A copy of the CDC influenza VISs are included in Section 2 of this manual or on the Web at http://www.cdc.gov/vaccines/pubs/vis/default.htm VA staff may also provide patients with other information or educational material in addition to the CDC VIS.
2. **Ensure vaccine recipient meets criteria to receive LAIV. Healthy persons ages 2 years of age through 49 years of age and are not pregnant.** (See the

CDC Vaccine Information Sheet [Section I, page 12] or Section II.)

LAIV should *NOT* be given to:

- people who are 50 or over, or children under 2 years old
- anyone with history of hypersensitivity, or anaphylactic reaction, to any component of FluMist®
- persons with underlying medical conditions such as these:
  - Person with history of hypersensitivity, including anaphylaxis, to eggs, egg products, gelatin, arginine, or gentamicin
  - Have had a severe allergic reaction to previous influenza vaccinations (e.g., rash, hives, itching, difficulty breathing, tightness in the chest, swelling of the mouth, face, lips, or tongue)
  - Children and adolescents (6 months to 18 years of age) receiving aspirin or aspirin-containing therapy (or another salicylate)
  - Any person with asthma or children younger than 5 years with recurrent wheezing
  - Pregnant women
  - Persons with these underlying medical conditions
  - Heart disease
  - Lung disease
  - Kidney disease
  - Liver disease
  - Immunosuppressed/ immunodeficiency disease
  - Diabetes
  - Anemia or other blood disorders
  - Muscle or nerve disorders (i.e., seizure disorders or cerebral palsy)
  - History of Guillain-Barré Syndrome

3. **Concurrent Administration of Influenza Vaccine with Other Live Attenuated Vaccines.** In the absence of specific data indicating interference, following ACIP's general recommendations for vaccination is prudent. With Live Vaccine administration, separate by a 4 week interval if not administered simultaneously. (CDC General Recommendations on immunization, recommendations of the Advisory Committee on immunization Practices (ACIP) and the American Academy of Family Physicians)
4. **Administer vaccine intranasally; only one dose of 0.2 ml per season for adults.** Remove the vaccine pre-filled single use sprayer from refrigerator. While the recipient is in the upright position, insert tip of sprayer just inside the nose and rapidly depress the plunger until the dose-divider clip stops the plunger. Remove the dose-divider clip from the sprayer to administer the second half of the dose (approximately 0.1 ml) into the other nostril. If sneezing occurs, do not repeat dose. FluMist administration should be postponed until after the acute phase (approximately 72 hours) of a febrile or respiratory illness.
5. **Disposal of sprayer.** Once LAIV has been administered, the sprayer should be disposed of according to the standard procedures for medical waste.
6. **Prepare and watch for an allergic reaction (anaphylaxis).** Acute anaphylactic reactions are very rare, occurring after approximately one out of every 500,000 doses of vaccine. When they occur, however, you must take immediate action. No vaccine should ever be administered unless epinephrine, diphenhydramine, adult airways, and blood pressure cuffs are on hand.

Note the live attenuated influenza vaccine (LAIV) should only be given to a *healthy, non-pregnant* population within a specific age group (2 to 49 years of age).

Though rare, as with any vaccine, post vaccination reactions can occur. Follow institution protocol for management of allergic reaction.

Employees and volunteers should be familiar with an anaphylaxis protocol and with cardiopulmonary resuscitation (CPR).

After you have administered a vaccine to the vaccine recipient, instruct the recipient to report any itching, redness (with or without hives), difficulty breathing, or abdominal pain within several minutes of administration. Having the vaccine recipient wait 15 minutes in a post-injection area is suggested but is not officially required.

7. **Storage:** LAIV is shipped from the distributor to the receiving health care facility in a refrigerated state and should be refrigerated upon receipt and kept refrigerated until used. Refrigerated vaccine is good for use until expiration date. Do not freeze vaccine. Store between 2–8° C (35–46° F). Check refrigerator temp where vaccine is stored 2 x daily.

Content for Live Attenuated Influenza Vaccine (LAIV) information obtained from MMWR, Influenza Vaccination of Health-Care Personnel; Recommendations of the Health Care Infection Control Practices Advisory Committee (HICPAC) and the Advisory Committee on Immunization Practices (ACIP); Feb 24, 2006 / Vol. 55 / No. RR-2; MMWR Prevention and Control of Seasonal Influenza with Vaccines, Recommendations of the Advisory Committee on Immunization Practices (ACIP), 2009, Early Release, July 24, 2009/Vol.58 and Package Insert (Circular); Influenza virus Vaccine Live, Intranasal FluMist®, 2009–2010 formula

Related Resources

Instruction sheets on vaccine administration are also available from the Immunization Action Coalition (IAC):

1. "How to administer IM and SC injections to adults," available at: http://www.immunize.org/catg.d/p2020A.pdf
2. "Administering vaccines to adults: Dose, route, site, needle size, and preparation," available at: http://www.immunize.org/catg.d/p3084.pdf
3. Instructions for administration of LAIV http://www.medimmune.com/providers/flumist.asp
4. For a detailed explanation and demonstration of immunization techniques, the 35-minute video "Immunization Techniques: Safe, Effective, Caring," can be ordered through the IAC at http://www.immunize.org, click the link for Video: IZ Techniques.

Appendix B: Pneumococcal Vaccine Information

Pneumococcal vaccine (Pneumococcal Polysaccharide Vaccine, PPV 23) is used to decrease the risk of serious pneumococcal disease and its complications.

PPV 23 may be administered to adults any time during the year. It is recommended for the following adults: who meet any of the criteria or have conditions listed below:

Age 65 and older

Adults with long-term health problems:

- Heart disease
- Lung disease
- Sickle cell disease
- Diabetes
- Alcoholism
- Cirrhosis of the liver
- Cerebrospinal fluid leaks
- Cochlear implant

Adults who have a disease or condition that lowers the body's resistance to infection:

- HIV infection or AIDS
- Hodgkin's disease
- Lymphoma
- Leukemia
- Kidney failure
- Nephrotic syndrome
- Multiple myeloma
- Absent or damaged spleen
- Organ transplant candidate or recipient
- Bone marrow transplant candidate or recipient

Adults who are receiving treatment that lowers the body's resistance to infection:

- Long-term steroids
- Certain cancer drugs
- Radiation therapy

Adults who smoke or have asthma:

If elective splenectomy or cochlear implant is being considered, the vaccine should be given at least 2 weeks prior to the procedure. If that is not feasible, vaccinate as soon as possible after surgery. For persons starting chemotherapy or other immunosuppressive therapy, if possible, vaccination should be administered at least 2 weeks prior to therapy.

Only two doses of Pneumococcal Vaccine at most are given.

Frequently Asked Questions (FAQs)

1. How often should pneumococcal vaccine be given?

Most adults 65 and older only need one dose if they have not received an earlier dose. Those who need a second dose include:

- Adults age 65 years and older previously vaccinated should receive a second dose if five or more years have passed since the first dose and they were less than age 65 years at the time of the first dose.
- Adults at the highest risk of pneumococcal infections should receive a second dose *five or more years after the first*

Pneumococcal polysaccharide vaccine can be administered at the same time as influenza vaccine, using a different site.


LIFETIME IMMUNIZATION RECORD

Always carry this record with you and have your healthcare professional or clinic keep it up to date.

Last name: First name: M.I.

Birthdate: (mo.) – (day) – (yr.)

Patient Number:

Printed by Immunization Action Coalition, Saint Paul, MN
www.immunize.org • www.vaccineinformation.org

Medical notes (e.g., allergies, vaccine reactions):

Healthcare provider: List the month/yr for each vaccination given. Record the generic abbreviation (e.g., PCV7, DTaP-IPV/Hib), not the trade name. For combination vaccines, fill in a row for each separate antigen in the combination.

Date visit/ shot due	Healthcare professional or clinic	Date given mo/day/yr	Type of vaccine	Vaccine
				Hepatitis B (Hep B, HepA-HepB)
				Diphtheria, Tetanus, Pertussis (DTaP, Tdap, DT, Td), Tetanus, Diphtheria (DTaP/Hib, DTaP-IPV, DTaP-IPV/Hib)

To learn more about vaccines, visit www.vaccineinformation.org and www.immunize.org

dose, regardless of the age at which the first dose was given. Adults at the highest risk include those with:

- HIV infection or AIDS
- Absent or damaged spleen
- Sickle cell disease
- Organ or bone marrow recipients
- Nephrotic syndrome
- Immunosuppressive treatment with X-rays, cancer drugs or long-term steroids
- Cancer, leukemia, lymphoma, or multiple myeloma

- Only two doses at most are given.

2. Should a dose be repeated if a patient is uncertain of having received it before?

If the patient's vaccination status is unknown, those in the recommended group should be administered pneumococcal vaccine. Studies have shown that adults who were re-vaccinated 4 years or more after an initial vaccination did not have an increased incidence of side effects. Consider supplying patients who have trouble remembering their vaccination history with a personal immunization card. Examples of cards are available at https://www.immunize.org/adultizcards/index.htm.

3. How is PPV 23 administered?

Pneumococcal polysaccharide vaccine may be given IM (intramuscularly) with a 22–25 g 1–1-1/2-inch needle in the deltoid or SC (subcutaneously) in the fatty tissue over the triceps with a 23–25 g 5/8 inch needle.

Contraindications to vaccination include severe allergic reaction to one of the components to the vaccine, or following the first dose of vaccination. Vaccination should be delayed for persons with moderate or severe acute illness until their condition improves. Minor illnesses, for example a minor upper respirator infection are not a contraindication. Women who are at risk for pneumococcal disease and are candidates for vaccination should be vaccinated prior to pregnancy.

Pneumococcal Vaccination during an Outbreak of Novel Influenza A (H1N1)

During influenza outbreaks, pneumococcal vaccines may be useful in preventing secondary pneumococcal infections and reducing illness and death. As a result, the CDC issued interim guidance regarding vaccination with the pneumococcal vaccine during an outbreak of novel influenza A (H1N1) to prevent pneumococcal infections. To review CDC guidance, visit: http://www.cdc.gov/h1n1flu/guidance/ppsv_h1n1.htm

All people who have existing indications for pneumococcal polysaccharide vaccine (PPSV23) should continue to be vaccinated according to current ACIP recommendations during the outbreak of novel influenza A (H1N1). Emphasis should be placed on vaccinating people aged less than 65 years who have established high-risk conditions. Coverage with pneumococcal vaccinations among this group is low and this group appears to be overrepresented among severe cases of novel influenza A (H1N1) infection, based on currently available data. Use of PPSV23 among people without current indications for vaccination is not recommended at this time.

CDC VIS for PPV here: http://www.cdc.gov/vaccines/pubs/vis/downloads/vis-ppv.pdf

Appendix C: Influenza Vaccine Documentation in the VA Computerized Patient Record System (CPRS)

Appropriate documentation of influenza vaccine administration is necessary to provide an accurate record of the patients' immunization history.

Documentation during mass influenza vaccination clinics can be a challenge, but a process should be in place to ensure it is complete and accurate.

Although a national clinical reminder for influenza vaccination is not available, individual facilities should implement a clinical reminder locally to help track the rate of influenza vaccinations. In April 2006, the National Clinical Reminders Group recommended each VA build a uniform health summary that included any local reminders for influenza vaccination. This health summary allows the user to view a record of all immunizations given at any VA site and can be accessed from the Reports Tab of CPRS under Health Summaries or in VistA Web. For assistance creating reminder dialogs and/or a health summary, contact your local facility's Office of Information Technology (OIT) staff. Members of the OIT staff are an important part of the team working on documentation of vaccine administration. Ideally, each facility/VISN would have a designated staff person to work on projects such as this.

The following are suggested processes for documenting influenza vaccinations in CPRS:

1. Inpatient—All influenza vaccinations should be entered on the patient's immunization list (i.e., entered in the V IMMUNIZATION file). This can be done in a number of different ways depending on your site and the location of the patient, but the maintenance of an accurate and up to date immunization list is critical.
2. Recording the administration of a vaccine dose in the Bar Code Medication Administration (BCMA) system on inpatients *does not* result in the entry of the vaccination on the patient's immunization list unless local programming has been accomplished. If no local programming exists to perform this function, then the site needs to define a process to ensure that ALL vaccinations administered to inpatients are appropriately recorded on the immunization list.
3. Outpatient vaccinations can be entered via a reminder dialog template or a clinical reminder dialog.

The CPT code for inactivated (injectable) influenza vaccine is 90658. The CPT code for LAIV is 90660. This guidance is a recommendation only and is not mandated by VA policy for 2009–2010.

4. Direct entry of the vaccination into the Patient Care Encounter (PCE) can be made after administration of the vaccine.
5. Entry of the Current Procedural Terminology (CPT) code for a vaccination will result in the automatic update of the patient's immunization list if the PCE CODE MAPPING file contains a link from that CPT code to the correct immunization.

Utilizing these processes will assure entry of the correct CPT Codes for vaccine administration and the specific vaccine directly into the PCE VISIT files as well as the Immunization section of the encounter form. Completed documentation of the influenza vaccination can be viewed in the progress notes in CPRS with the actual immunizations and related CPT codes displayed in a window below the progress note.

Appendix D: Documenting Health Care Worker Vaccination: Using the Occupational Health Record-keeping System (OHRS)

Appropriate documentation of influenza vaccine administration is necessary to provide an accurate record of VHA's staff vaccination history. Documentation during mass influenza vaccination clinics can be a challenge, but a process should be in place to ensure it is complete and accurate.

Occupational health staff have the capability to document staff vaccinations in an electronic database specifically designed for staff. The Occupational Health Record-keeping System is a Web based application.

The following are suggested processes for documenting influenza vaccinations in OHRS:

1. Individual vaccination
   a. Search and select the individual who is to receive the vaccine
   b. With the individual selected, click Create Encounter
   c. From the **Category** drop-down list, select General Health
   d. From the **Type** drop-down list, select Vaccination
   e. Enter the **Purpose** for the vaccination encounter (free text)
   f. Click **Submit**
   g. A list of vaccines displays. **Highlight** seasonal influenza vaccine. Click **Add**.
   h. Click **Submit**
   i. A template appears
   j. The template will display whether or not the individual has already received the vaccine if it has been documented in OHRS
   k. The template is divided into several sections: subjective, objective, assessment, plan and encounter codes. Only those sections with a "*" are required (plan and encounter codes).
   l. Click the plan tab and enter the required information. The template is dynamic and the required fields may change depending on what information is added.
      - The first question is was the vaccine received elsewhere. If yes, document date received.
      - If no, additional information is required to document vaccination.
   m. Under the encounter codes tab, staff must select diagnostic and procedure codes. Default codes have been identified, but staff have the ability of searching and selecting another code, if applicable.

2. Quickload

Quickload allows occupational health staff to pre-load information about the vaccine being administered to a group of individuals (VIS, dose, route, manufacturer, lot number, and expiration date). Once the vaccine

information is completed, staff search and select the individuals who received the vaccine.

Staff may modify the injection site and time administered for each individual vaccinated, so that accurate information is collected. Once all the vaccination information is entered, the information is submitted. Documentation is now complete in all the selected records.

Occupational Health staff may generate summary and detailed reports on employee vaccination. Reports include: vaccination status and vaccination rate.

Appendix E: Prevention and Control of Influenza

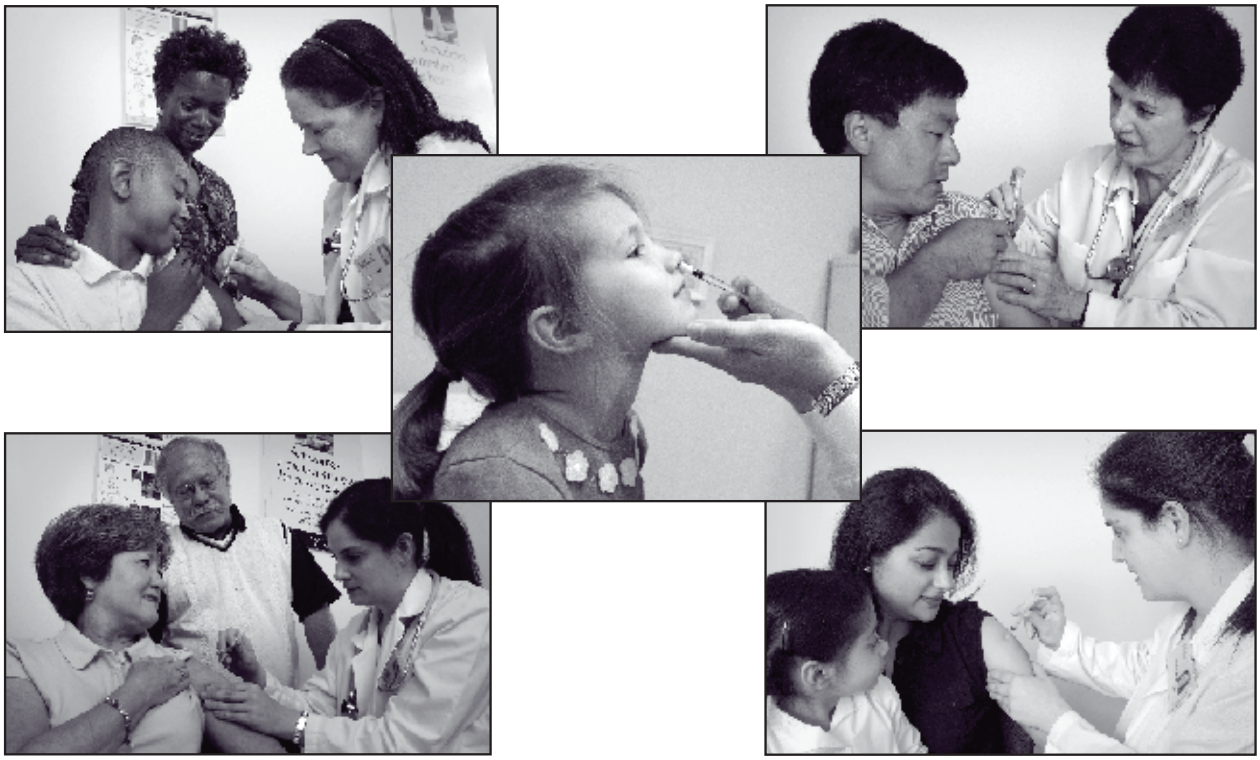
Prevention and Control of Seasonal Influenza with Vaccines: Recommendations of the Advisory Committee on Immunization Practices (ACIP), 2009 July 31. Vol. 58 / No. RR–8; 1-52. Available at http://www.cdc.gov/mmwr/preview/mmwrhtml/rr5808a1.htm

MMWR™
Morbidity and Mortality Weekly Report
www.cdc.gov/mmwr

Recommendations and Reports July 31, 2009 / Vol. 58 / No. RR-8

Prevention and Control of Seasonal Influenza with Vaccines

Recommendations of the Advisory Committee on Immunization Practices (ACIP), 2009



DEPARTMENT OF HEALTH AND HUMAN SERVICES
CENTERS FOR DISEASE CONTROL AND PREVENTION

The *MMWR* series of publications is published by the Coordinating Center for Health Information and Service, Centers for Disease Control and Prevention (CDC), U.S. Department of Health and Human Services, Atlanta, GA 30333.

Suggested Citation: Centers for Disease Control and Prevention. [Title]. MMWR 2009;58(No. RR-#):[inclusive page numbers].

CONTENTS

Vol. 58 / RR-8 Recommendations and Reports 1

Prevention and Control of Seasonal Influenza with Vaccines

Recommendations of the Advisory Committee on Immunization Practices (ACIP), 2009

Prepared by
Anthony E. Fiore, MD[1]
David K. Shay, MD[1]
Karen Broder, MD[2]
John K. Iskander, MD[2]
Timothy M. Uyeki, MD[1]
Gina Mootrey, DO[3]
Joseph S. Bresee, MD[1]
Nancy J. Cox, PhD[1]
[1]*Influenza Division, National Center for Immunization and Respiratory Diseases*
[2]*Immunization Safety Office, Division of Healthcare Quality Promotion, National Center for Preparedness, Detection and Control of Infectious Diseases*
[3]*Immunization Services Division, National Center for Immunization and Respiratory Diseases*

Summary

This report updates the 2008 recommendations by CDC's Advisory Committee on Immunization Practices (ACIP) regarding the use of influenza vaccine for the prevention and control of seasonal influenza (CDC. Prevention and control of influenza: recommendations of the Advisory Committee on Immunization Practices [ACIP]. MMWR 2008;57[No. RR-7]). Information on vaccination issues related to the recently identified novel influenza A H1N1 virus will be published later in 2009. The 2009 seasonal influenza recommendations include new and updated information. Highlights of the 2009 recommendations include 1) a recommendation that annual vaccination be administered to all children aged 6 months–18 years for the 2009–10 influenza season; 2) a recommendation that vaccines containing the 2009–10 trivalent vaccine virus strains A/Brisbane/59/2007 (H1N1)-like, A/Brisbane/10/2007 (H3N2)-like, and B/Brisbane/60/2008-like antigens be used; and 3) a notice that recommendations for influenza diagnosis and antiviral use will be published before the start of the 2009–10 influenza season. Vaccination efforts should begin as soon as vaccine is available and continue through the influenza season. Approximately 83% of the United States population is specifically recommended for annual vaccination against seasonal influenza; however, <40% of the U.S. population received the 2008–09 influenza vaccine. These recommendations also include a summary of safety data for U.S. licensed influenza vaccines. These recommendations and other information are available at CDC's influenza website (http://www.cdc.gov/flu); any updates or supplements that might be required during the 2009–10 influenza season also can be found at this website. Vaccination and health-care providers should be alert to announcements of recommendation updates and should check the CDC influenza website periodically for additional information.

Introduction

In the United States, annual epidemics of seasonal influenza occur typically during the late fall through early spring. Influenza viruses can cause disease among persons in any age group, but rates of infection are highest among children (*1–3*). Rates of serious illness and death are highest among persons aged ≥65 years, children aged <2 years, and persons of any age who have medical conditions that place them at increased risk for complications from influenza (*1,4,5*). An annual average of approximately 36,000 deaths during 1990–1999 and 226,000 hospitalizations during 1979–2001 have been associated with influenza epidemics (*6,7*).

Annual influenza vaccination is the most effective method for preventing influenza virus infection and its complications. Influenza vaccine can be administered to any person aged >6 months who does not have contraindications to vaccination to reduce the likelihood of becoming ill with influenza or of transmitting influenza to others. Trivalent inactivated influenza vaccine (TIV) can be used for any person aged ≥6 months, including those with high-risk conditions (Boxes 1 and 2). Live, attenuated influenza vaccine (LAIV) may be used for healthy, nonpregnant persons aged 2–49 years. No preference

The material in this report originated in the National Center for Immunization and Respiratory Diseases, Anne Schuchat, MD, Director; the Influenza Division, Nancy Cox, PhD, Director; the Office of the Chief Science Officer, Tanja Popovic, MD, Chief Science Officer; the Immunization Safety Office, Frank Destefano, MD, Director; and the Immunization Services Division, Lance Rodewald, MD, Director.
Corresponding preparer: Anthony Fiore, MD, Influenza Division, National Center for Immunization and Respiratory Diseases, CDC, 1600 Clifton Road, NE, MS A-20, Atlanta, GA 30333. Telephone: 404-639-3747; Fax: 404-639-3866; E-mail: afiore@cdc.gov.

BOX 1. Summary of seasonal influenza vaccination recommendations, 2009: children and adolescents aged 6 months–18 years

All children aged 6 months–18 years should be vaccinated annually.

Children and adolescents at higher risk for influenza complications should continue to be a focus of vaccination efforts as providers and programs transition to routinely vaccinating all children and adolescents, including those who:

- are aged 6 months–4 years (59 months);
- have chronic pulmonary (including asthma), cardiovascular (except hypertension), renal, hepatic, cognitive, neurologic/neuromuscular, hematological or metabolic disorders (including diabetes mellitus);
- are immunosuppressed (including immunosuppression caused by medications or by human immunodeficiency virus);
- are receiving long-term aspirin therapy and therefore might be at risk for experiencing Reye syndrome after influenza virus infection;
- are residents of long-term care facilities; and
- will be pregnant during the influenza season.

Note: Children aged <6 months cannot receive influenza vaccination. Household and other close contacts (e.g., daycare providers) of children aged <6 months, including older children and adolescents, should be vaccinated.

is indicated for LAIV or TIV when considering vaccination of healthy, nonpregnant persons aged 2–49 years. Because the safety or effectiveness of LAIV has not been established in persons with underlying medical conditions that confer a higher risk for influenza complications, these persons should be vaccinated only with TIV. Influenza viruses undergo frequent antigenic change (i.e., antigenic drift); to gain immunity against viruses in circulation, patients must receive an annual vaccination against the influenza viruses that are predicted on the basis of viral surveillance data. . Although vaccination coverage has increased in recent years for many groups targeted for routine vaccination, coverage remains low among most of these groups, and strategies to improve vaccination coverage, including use of reminder/recall systems and standing orders programs, should be implemented or expanded.

Antiviral medications are an adjunct to vaccination and are effective when administered as treatment and when used for chemoprophylaxis after an exposure to influenza virus. However, the emergence since 2005 of resistance to one or more of the four licensed antiviral agents (oseltamivir, zanamivir, amantadine and rimantadine) among circulating strains

BOX 2. Summary of seasonal influenza vaccination recommendations, 2009: adults

Annual vaccination against influenza is recommended for any adult who wants to reduce the risk of becoming ill with influenza or of transmitting it to others. Vaccination is recommended for all adults without contraindications in the following groups, because these persons either are at higher risk for influenza complications, or are close contacts of persons at higher risk:

- persons aged ≥50 years;
- women who will be pregnant during the influenza season;
- persons who have chronic pulmonary (including asthma), cardiovascular (except hypertension), renal, hepatic, cognitive, neurologic/neuromuscular, hematological or metabolic disorders (including diabetes mellitus);
- persons who have immunosuppression (including immunosuppression caused by medications or by human immunodeficiency virus;
- residents of nursing homes and other long-term care facilities;
- health-care personnel;
- household contacts and caregivers of children aged <5 years and adults aged ≥50 years, with particular emphasis on vaccinating contacts of children aged <6 months; and
- household contacts and caregivers of persons with medical conditions that put them at higher risk for severe complications from influenza.

has complicated antiviral treatment and chemoprophylaxis recommendations. Updated antiviral treatment and chemoprophylaxis recommendations will be provided in a separate set of guidelines later in 2009. CDC has issued interim recommendations for antiviral treatment and chemoprophylaxis of influenza (*8*), and these guidelines should be consulted pending issuance of new recommendations.

In April 2009, a novel influenza A (H1N1) virus that is similar to influenza viruses previously identified in swine was determined to be the cause of an influenza respiratory illness that spread across North America and was identified in many areas of the world by May 2009. The symptoms of novel influenza A (H1N1) virus infection are similar to those of seasonal influenza, and specific diagnostic testing is required to distinguish novel influenza A (H1N1) virus infection from seasonal influenza (*9*). The epidemiology of this illness is still being studied and prevention issues related to this newly emerging influenza virus will be published separately.

Methods

CDC's Advisory Committee on Immunization Practices (ACIP) provides annual recommendations for the prevention and control of influenza. The ACIP Influenza Vaccine Working Group* meets monthly throughout the year to discuss newly published studies, review current guidelines, and consider revisions to the recommendations. As they review the annual recommendations for ACIP consideration of the full committee, members of the working group consider a variety of issues, including burden of influenza illness, vaccine effectiveness, safety, and coverage in groups recommended for vaccination, feasibility, cost-effectiveness, and anticipated vaccine supply. Working group members also request periodic updates on vaccine and antiviral production, supply, safety and efficacy from vaccinologists, epidemiologists, and manufacturers. State and local vaccination program representatives are consulted. CDC's Influenza Division (available at http://www.cdc.gov/flu) provides influenza surveillance and antiviral resistance data. The Vaccines and Related Biological Products Advisory Committee provides advice on vaccine strain selection to the Food and Drug Administration (FDA), which selects the viral strains to be used in the annual trivalent influenza vaccines.

Published, peer-reviewed studies are the primary source of data used by ACIP in making recommendations for the prevention and control of influenza, but unpublished data that are relevant to issues under discussion also might be considered. Among studies discussed or cited, those of greatest scientific quality and those that measured influenza-specific outcomes are the most influential. For example, population-based estimates that use outcomes associated with laboratory-confirmed influenza virus infection outcomes contribute the most specific data for estimates of influenza burden. The best evidence for vaccine or antiviral efficacy and effectiveness comes from randomized controlled trials that assess laboratory-confirmed influenza infections as an outcome measure and consider factors such as timing and intensity of influenza circulation and degree of match between vaccine strains and wild circulating strains (*10,11*). Randomized, placebo-controlled trials cannot be performed ethically in populations for which vaccination already is recommended, but observational studies that assess outcomes associated with laboratory-confirmed influenza infection can provide important vaccine or antiviral effectiveness data. Randomized, placebo-controlled clinical trials are the best source of vaccine and antiviral safety data for common adverse events; however, such studies do not have the statistical power to identify rare but potentially serious adverse events. The frequency of rare adverse events that might be associated with vaccination is best assessed by reviewing computerized medical records from large linked clinical databases and medical charts of persons who are identified as having a potential adverse event after vaccination (*12,13*). Vaccine coverage data from a nationally representative, randomly selected population that includes verification of vaccination through health-care record review are superior to coverage data derived from limited populations or without verification of vaccination; however, these data rarely are available for older children or adults (*14*). Finally, studies that assess vaccination program practices that improve vaccination coverage are most influential in formulating recommendations if the study design includes a nonintervention comparison group. In cited studies that included statistical comparisons, a difference was considered to be statistically significant if the p-value was <0.05 or the 95% confidence interval (CI) around an estimate of effect allowed rejection of the null hypothesis (i.e., no effect).

These recommendations were presented to the full ACIP and approved in February 2009. Modifications were made to the ACIP statement during the subsequent review process at CDC to update and clarify wording in the document. Vaccine recommendations apply only to persons who do not have contraindications to vaccine use (see Contraindications and Precautions for use of TIV and Contraindications and Precautions for use of LAIV). Data presented in this report were current as of July 17, 2009. Further updates, if needed, will be posted at CDC's influenza website (http://www.cdc.gov/flu).

Primary Changes and Updates in the Recommendations

The 2009 recommendations include three principal changes or updates:

- Annual vaccination of all children aged 6 months–18 years should begin as soon as the 2009–10 influenza vaccine is available. Annual vaccination of all children aged 6 months–4 years (59 months) and older children with conditions that place them at increased risk for complications from influenza should continue to be a primary focus of vaccination efforts as providers and programs transition to routinely vaccinating all children.
- The 2009–10 trivalent vaccine virus strains are A/Brisbane/59/2007 (H1N1)-like, A/Brisbane/10/2007 (H3N2)-like, and B/Brisbane 60/2008-like antigens.
- Most seasonal influenza A (H1N1) virus strains tested from the United States and other countries are now resistant to oseltamivir. Recommendations for influenza diagnosis and antiviral use will be published later

*A list of members appears on on page 52 of this report.

in 2009. CDC issued interim recommendations for antiviral treatment and chemoprophylaxis of influenza in December 2008, and these should be consulted for guidance pending recommendations from the ACIP (*8*).

Background and Epidemiology

Biology of Influenza

Influenza A and B are the two types of influenza viruses that cause epidemic human disease. Influenza A viruses are categorized into subtypes on the basis of two surface antigens: hemagglutinin and neuraminidase. Since 1977, influenza A (H1N1) viruses, influenza A (H3N2) viruses, and influenza B viruses have circulated globally. Influenza A (H1N2) viruses that probably emerged after genetic reassortment between human A (H3N2) and A (H1N1) viruses also have been identified in some influenza seasons. In April 2009, human infections with a novel influenza A (H1N1) virus were identified; as of June 2009, infections with the novel influenza A (H1N1) virus have been reported worldwide. This novel virus is derived partly from influenza A viruses that circulate in swine and is antigenically distinct from human influenza A (H1N1) viruses in circulation since 1977. Influenza A subtypes and B viruses are further separated into groups on the basis of antigenic similarities. New influenza virus variants result from frequent antigenic change (i.e., antigenic drift) resulting from point mutations and recombination events that occur during viral replication (*15*). Recent studies have begun to shed some light on the complex molecular evolution and epidemiologic dynamics of influenza A viruses (*16–18*).

Currently circulating influenza B viruses are separated into two distinct genetic lineages (Yamagata and Victoria) but are not categorized into subtypes. Influenza B viruses undergo antigenic drift less rapidly than influenza A viruses. Influenza B viruses from both lineages have circulated in most recent influenza seasons (*19*).

Immunity to the surface antigens, particularly the hemagglutinin, reduces the likelihood of infection (*20*). Antibody against one influenza virus type or subtype confers limited or no protection against another type or subtype of influenza virus. Furthermore, antibody to one antigenic type or subtype of influenza virus might not protect against infection with a new antigenic variant of the same type or subtype (*21*). Frequent emergence of antigenic variants through antigenic drift is the virologic basis for seasonal epidemics and is the reason for annually reassessing the need to change one or more of the recommended strains for influenza vaccines.

More dramatic changes, or antigenic shifts, occur less frequently. Antigenic shift occurs when a new subtype of influenza A virus appears and can result in the emergence of a novel influenza A virus with the potential to cause a pandemic. New influenza A subtypes have the potential to cause a pandemic when they are able to cause human illness and demonstrate efficient human-to-human transmission and little or no previously existing immunity has been identified among humans (*15*). Novel influenza A (H1N1) virus is not a new subtype, but because the large majority of humans appear to have no pre-existing antibody to key novel influenza A (H1N1) virus hemagglutinin epitopes, substantial potential exists for widespread infection (*16*).

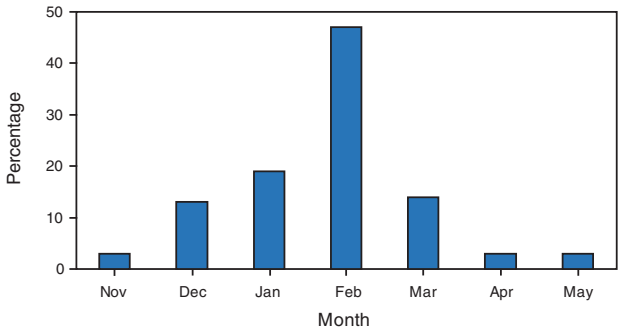
Health-Care Use, Hospitalizations, and Deaths Attributed to Influenza

In the United States, annual epidemics of influenza typically occur during the fall or winter months, but the peak of influenza activity can occur as late as April or May (Figure 1). Influenza-related complications requiring urgent medical care, including hospitalizations or deaths, can result from the direct effects of influenza virus infection, from complications associated with age or pregnancy, or from complications of underlying cardiopulmonary conditions or other chronic diseases. Studies that have measured rates of a clinical outcome without a laboratory confirmation of influenza virus infection (e.g., respiratory illness requiring hospitalization during influenza season) to assess the effect of influenza can be difficult to interpret because of circulation of other respiratory pathogens (e.g., respiratory syncytial virus) during the same time as influenza viruses (*22–24*). However, increases in healthcare provider visits for acute febrile respiratory illness occur each year during the time when influenza viruses circulate. Data from the U.S. Outpatient Influenza-like Illness Surveillance Network (ILINet) demonstrate the annual increase in physician visits for influenza-like illness (ILI)[†] and for each influenza season; for 2009, the data also indicate the recent resurgence of respiratory illness associated with circulation of novel influenza A (H1N1) virus (Figure 2) (*25,26*).

During seasonal influenza epidemics from 1979–1980 through 2000–2001, the estimated annual overall number of influenza-associated hospitalizations in the United States ranged from approximately 55,000 to 431,000 per annual epidemic (mean: 226,000) (*7*). The estimated annual number of deaths attributed to influenza from the 1990–91 influenza season through the 1998–99 season ranged from 17,000 to 51,000 per epidemic (mean: 36,000) (*6*). In the United States, the estimated number of influenza-associated deaths

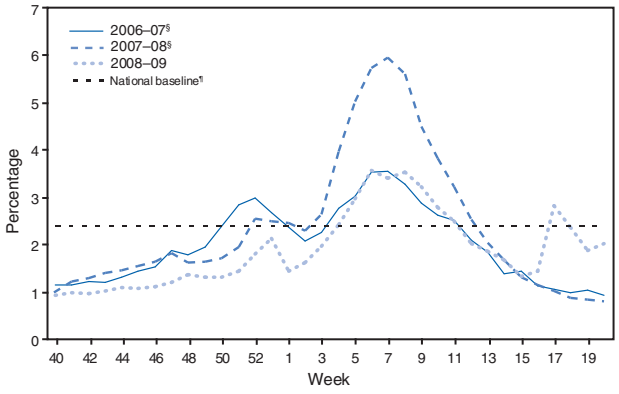
[†]ILI is defined as fever (temperature of >100°F [>37.8°C) and a cough and/or a sore throat in the absence of a known cause other than influenza.

FIGURE 1. Peak influenza activity, by month — United States, 1976–77 through 2008–09 influenza seasons



Source: Influenza Division, CDC.

FIGURE 2. Percentage of visits for influenza-like illness (ILI)* reported by U.S. Outpatient Influenza-like Illness Surveillance Network (ILINet),† by surveillance week — United States, 2008–2009 and 2006–07 and 2007–08 influenza seasons



* ILI is defined as fever (temperature of >100°F [>37.8°C) and a cough and/or a sore throat in the absence of a known cause other than influenza.

† The Outpatient Influenza-like Illness Surveillance Network (ILINet) consists of approximately 2,400 health-care providers in 50 states reporting approximately 16 million patient visits each year.

§ The 2006–07 and 2007–08 seasons did not have a week 53; therefore the week 53 data point for those seasons is an average of weeks 52 and 1.

¶ The national baseline is the mean percentage of visits for ILI during noninfluenza weeks for the previous three seasons plus two standard deviations. A noninfluenza week is a week during which <10% of specimens tested positive for influenza.

increased during 1990–1999. This increase was attributed in part to the substantial increase in the number of persons aged ≥65 years who were at increased risk for death from influenza complications (*6*). In one study, an average of approximately 19,000 influenza-associated pulmonary and circulatory deaths per influenza season occurred during 1976–1990 compared with an average of approximately 36,000 deaths per season during 1990–1999 (*6*). In addition, influenza A (H3N2) viruses, which have been associated with higher mortality (*27*), predominated in 90% of influenza seasons during 1990–1999 compared with compared with 57% of seasons during 1976–1990 (*6*).

Influenza viruses cause disease among persons in all age groups (*1–5*). Rates of infection are highest among children, but the risks for complications, hospitalizations, and deaths from influenza are higher among persons aged ≥65 years, young children, and persons of any age who have medical conditions that place them at increased risk for complications from influenza (*1,4,5,28–31*). Estimated rates of influenza-associated hospitalizations and deaths varied substantially by age group in studies conducted during different influenza epidemics. During 1990–1999, estimated average rates of influenza-associated pulmonary and circulatory deaths per 100,000 persons were 0.4–0.6 among persons aged 0–49 years, 7.5 among persons aged 50–64 years, and 98.3 among persons aged ≥65 years (*6*).

Children

Among children aged <5 years, influenza-related illness is a common cause of visits to medical practices and emergency departments (EDs). During two influenza seasons (2002–03 and 2003–04), the percentage of visits among children aged <5 years with acute respiratory illness or fever caused by laboratory-confirmed influenza ranged from 10%–19% of medical office visits to 6%–29% of EDs visits during the influenza season. On the basis of these data, the rate of visits to medical clinics for influenza was estimated to be 50–95 per 1,000 children, and the rate of visits to EDs was estimated to be 6–27 per 1,000 children (*32*). A multiyear study in New York City used viral surveillance data to estimate influenza strain-specific illness rates among ED visits. In addition to the expected variation by season and age group, influenza B epidemics were found to be an important cause of illness among school-aged children in several seasons, and annual epidemics of both influenza A and B peaked among school-aged children before other age groups (*33*). Retrospective studies using medical records data have demonstrated similar rates of illness among children aged <5 years during other influenza seasons (*29,34,35*). During the influenza season, an estimated 7–12 additional outpatient visits and 5–7 additional antibiotic prescriptions per 100 children aged <15 years have been documented when compared with periods when influenza viruses are not circulating, with rates decreasing with increasing age of the child (*35*). During 1993–2004 in the Boston area, the rate of ED visits for respiratory illness that was attributed to influenza virus based on viral surveillance data among children aged ≤7 years during the winter respiratory illness season ranged

from 22.0 per 1,000 children aged 6–23 months to 5.4 per 1,000 children aged 5–7 years (*36*).

Rates of influenza-associated hospitalization are substantially higher among infants and young children than among older children when influenza viruses are in circulation and are similar to rates for other groups considered at high risk for influenza-related complications *(37–42)*, including persons aged ≥65 years (*35,39*). During 1979–2001, on the basis of data from a national sample of hospital discharges of influenza-associated hospitalizations among children aged <5 years, the estimated rate of influenza-associated hospitalizations in the United States was 108 hospitalizations per 100,000 person-years (*7*). Recent population-based studies that measured hospitalization rates for laboratory-confirmed influenza in young children have documented hospitalization rates that are similar to or higher than rates derived from studies that analyzed hospital discharge data (*32,34,41,43,44*). Annual hospitalization rates for laboratory-confirmed influenza decrease with increasing age, ranging from 240–720 per 100,000 children aged <6 months to approximately 20 per 100,000 children aged 2–5 years (*32*). Hospitalization rates for children aged <5 years with high-risk medical conditions are approximately 250–500 per 100,000 children (*29,31,45*).

Influenza-associated deaths are uncommon among children. An estimated annual average of 92 influenza-related deaths (0.4 deaths per 100,000 persons) occurred among children aged <5 years during the 1990s compared with 32,651 deaths (98.3 per 100,000 persons) among adults aged ≥65 years (*6*). Of 153 laboratory-confirmed influenza-related pediatric deaths reported during the 2003–04 influenza season, 96 (63%) deaths occurred among children aged <5 years and 61 (40%) among children aged <2 years. Among the 149 children who died and for whom information on underlying health status was available, 100 (67%) did not have an underlying medical condition that was an indication for vaccination at that time (*46*). In California during the 2003–04 and 2004–05 influenza seasons, 51% of children with laboratory-confirmed influenza who died and 40% of those who required admission to an intensive care unit had no underlying medical conditions (*47*). These data indicate that although children with risk factors for influenza complications are at higher risk for death, the majority of pediatric deaths occur among children with no known high-risk conditions. The annual number of influenza-associated deaths among children reported to CDC for the past four influenza seasons has ranged from 44 during 2004–05 to 84 during 2007–08 (*48*). As of July 8, 2009, a total of 17 deaths caused by novel influenza A (H1N1) virus infection have occurred in 2009 among children in the United States (CDC, unpublished data, 2009).

Death associated with laboratory-confirmed influenza virus infection among children (defined as persons aged <18 years) is a nationally reportable condition. Deaths among children that have been attributed to co-infection with influenza and *Staphylococcus aureus*, particularly methicillin-resistant *S. aureus* (MRSA), have increased during the preceding four influenza seasons (*26,49*). The reason for this increase is not established but might reflect an increasing prevalence within the general population of colonization with MRSA strains, some of which carry certain virulence factors (*50,51*).

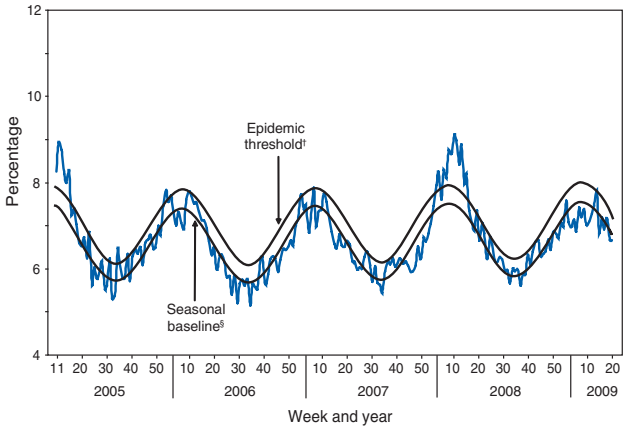
Adults

Hospitalization rates during the influenza season are substantially increased for persons aged ≥65 years. One retrospective analysis based on data from managed-care organizations collected during 1996–2000 estimated that the risk during influenza season among persons aged ≥65 years with underlying conditions that put them at risk for influenza-related complications (i.e., one or more of the conditions listed as indications for vaccination) was approximately 560 influenza-associated hospitalizations per 100,000 persons compared with approximately 190 per 100,000 healthy persons. Persons aged 50–64 years with underlying medical conditions also were at substantially increased risk for hospitalizations during influenza season compared with healthy adults aged 50–64 years. No increased risk for influenza-related hospitalizations was demonstrated among healthy adults aged 50–64 years or among those aged 19–49 years, regardless of underlying medical conditions (*28*).

Influenza is an important contributor to the annual increase in deaths attributed to pneumonia and influenza that is observed during the winter months (Figure 3). During 1976–2001, an estimated yearly average of 32,651 (90%) influenza-related deaths occurred among adults aged ≥65 years (*6*). Risk for influenza-related death was highest among the oldest elderly, with persons aged ≥85 years 16 times more likely to die from an influenza-related illness than persons aged 65–69 years (*6*).

The duration of influenza symptoms is prolonged and the severity of influenza illness increased among persons with human immunodeficiency virus (HIV) infection (*52–56*). A retrospective study of young and middle-aged women enrolled in Tennessee's Medicaid program determined that the attributable risk for cardiopulmonary hospitalizations among women with HIV infection was higher during influenza seasons than it was either before or after influenza was circulating. The risk for hospitalization was higher for HIV-infected women than it was for women with other underlying medical conditions (*57*). Another study estimated that the risk for influenza-

FIGURE 3. Percentage of all deaths attributed to pneumonia and influenza — United States, 122 cities mortality reporting system,* 2005–2009



* Each week, the vital statistics offices of 122 cities report the total number of death certificates received and the number of those for which pneumonia or influenza (P&I) was listed as the underlying or contributing cause of death by age group. The percentage of all deaths attributable to P&I are compared with a seasonal baseline and epidemic threshold value calculated for each week.

† An increase of 1.645 standard deviations above the seasonal baseline deaths is considered the "epidemic threshold," i.e., the point at which the observed proportion of deaths attributed to pneumonia or influenza was significantly higher than would be expected at that time of the year in the absence of substantial influenza-related mortality.

§ The seasonal baseline of P&I deaths is calculated using a periodic regression model that incorporates a robust regression procedure applied to data from the previous 5 years.

related death was 94–146 deaths per 100,000 persons with acquired immunodeficiency syndrome (AIDS) compared with 0.9–1.0 deaths per 100,000 persons aged 25–54 years and 64–70 deaths per 100,000 persons aged ≥65 years in the general population (*58*).

Influenza-related excess deaths among pregnant women were reported during the pandemics of 1918–1919 and 1957–1958 (*59–63*). Case reports and several epidemiologic studies also indicate that pregnancy increases the risk for influenza complications (*64–69*) for the mother. The majority of studies that have attempted to assess the effect of influenza on pregnant women have measured changes in excess hospitalizations for respiratory illness during influenza season but not laboratory-confirmed influenza hospitalizations. Pregnant women have an increased number of medical visits for respiratory illnesses during influenza season compared with nonpregnant women (*70*). Hospitalized pregnant women with respiratory illness during influenza season have increased lengths of stay compared with hospitalized pregnant women without respiratory illness. Rates of hospitalization for respiratory illness were twice as common during influenza season (*71*). A retrospective cohort study of approximately 134,000 pregnant women conducted in Nova Scotia during 1990–2002 compared medical record data for pregnant women to data from the same women during the year before pregnancy. Among pregnant women, 0.4% were hospitalized and 25% visited a clinician during pregnancy for a respiratory illness. The rate of third-trimester hospital admissions during the influenza season was five times higher than the rate during the influenza season in the year before pregnancy and more than twice as high as the rate during the noninfluenza season. An excess of 1,210 hospital admissions in the third trimester per 100,000 pregnant women with comorbidities and 68 admissions per 100,000 women without comorbidities was reported (*72*). In one study, pregnant women with respiratory hospitalizations did not have an increase in adverse perinatal outcomes or delivery complications (*73*); another study indicated an increase in delivery complications, including fetal distress, preterm labor, and cesarean delivery. However, infants born to women with laboratory-confirmed influenza during pregnancy do not have higher rates of low birth weight, congenital abnormalities, or lower Apgar scores compared with infants born to uninfected women (*64,74*).

Options for Controlling Influenza

The most effective strategy for preventing influenza is annual vaccination (*10,15*). Strategies that focus on providing routine vaccination to persons at higher risk for influenza complications have long been recommended, although coverage among the majority of these groups remains low. Routine vaccination of certain persons (e.g., children, contacts of persons at risk for influenza complications, and health-care personnel [HCP]) who serve as a source of influenza virus transmission might provide additional protection to persons at risk for influenza complications and reduce the overall influenza burden. However, coverage levels among these persons need to be increased before effects on transmission can be measured reliably. Antiviral drugs used for chemoprophylaxis or treatment of influenza are adjuncts to vaccine but are not substitutes for annual vaccination. However, antiviral drugs might be underused among those hospitalized with influenza (*75*). Nonpharmacologic interventions (e.g., advising frequent handwashing and improved respiratory hygiene) are reasonable and inexpensive; these strategies have been demonstrated to reduce respiratory diseases; reductions in detectable influenza A viruses on hands after handwashing also have been demonstrated (*76–78*). Few data are available to assess the effects of community-level respiratory disease mitigation strategies (e.g., closing schools, avoiding mass gatherings, or using respiratory protection) on reducing influenza virus transmission during typical seasonal influenza epidemics (*79,80*).

Influenza Vaccine Efficacy, Effectiveness, and Safety

Evaluating Influenza Vaccine Efficacy and Effectiveness Studies

The efficacy (i.e., prevention of illness among vaccinated persons in controlled trials) and effectiveness (i.e., prevention of illness in vaccinated populations) of influenza vaccines depend in part on the age and immunocompetence of the vaccine recipient, the degree of similarity between the viruses in the vaccine and those in circulation (see Effectiveness of Influenza Vaccination when Circulating Influenza Virus Strains Differ from Vaccine Strains), and the outcome being measured. Influenza vaccine efficacy and effectiveness studies have used multiple possible outcome measures, including the prevention of medically attended acute respiratory illness (MAARI), prevention of laboratory-confirmed influenza virus illness, prevention of influenza or pneumonia-associated hospitalizations or deaths, or prevention of seroconversion to circulating influenza virus strains. Efficacy or effectiveness for more specific outcomes such as laboratory-confirmed influenza typically will be higher than for less specific outcomes such as MAARI because the causes of MAARI include infections with other pathogens that influenza vaccination would not be expected to prevent (*81*). Observational studies that compare less-specific outcomes among vaccinated populations to those among unvaccinated populations are subject to biases that are difficult to control for during analyses. For example, an observational study that determines that influenza vaccination reduces overall mortality might be biased if healthier persons in the study are more likely to be vaccinated (*82,83*). Randomized controlled trials that measure laboratory-confirmed influenza virus infections as the outcome are the most persuasive evidence of vaccine efficacy, but such trials cannot be conducted ethically among groups recommended to receive vaccine annually.

Influenza Vaccine Composition

Both LAIV and TIV contain strains of influenza viruses that are antigenically equivalent to the annually recommended strains: one influenza A (H3N2) virus, one influenza A (H1N1) virus, and one influenza B virus. Each year, one or more virus strains in the vaccine might be changed on the basis of global surveillance for influenza viruses and the emergence and spread of new strains. For the 2009–10 influenza season, the influenza B vaccine virus strain was changed to B/Brisbane/60/2008, a representative of the B/Victoria lineage) compared with the 2008–09 season. The influenza A (H1N1 and H3N2 vaccine virus strains were not changed (*84*). Viruses for both types of currently licensed vaccines are grown in eggs. Both vaccines are administered annually to provide optimal protection against influenza virus infection (Table 1). Both TIV and LAIV are widely available in the United States. Although both types of vaccines are expected to be effective, the vaccines differ in several respects (Table 1).

Major Differences Between TIV and LAIV

During the preparation of TIV, the vaccine viruses are made noninfectious (i.e., inactivated or killed) (*15*). Only subvirion and purified surface antigen preparations of TIV (often referred to as "split" and subunit vaccines, respectively) are available in the United States. TIV contains killed viruses and thus cannot cause influenza. LAIV contains live, attenuated influenza viruses that have the potential to cause mild signs or symptoms (e.g., runny nose, nasal congestion, fever, or sore throat). LAIV is administered intranasally by sprayer, whereas TIV is administered intramuscularly by injection. LAIV is licensed for use among nonpregnant persons aged 2–49 years; safety has not been established in persons with underlying medical conditions that confer a higher risk for influenza complications. TIV is licensed for use among persons aged ≥6 months, including those who are healthy and those with chronic medical conditions (Table 1).

Correlates of Protection after Vaccination

Immune correlates of protection against influenza infection after vaccination include serum hemagglutination inhibition antibody and neutralizing antibody (*20,85*). Increased levels of antibody induced by vaccination decrease the risk for illness caused by strains that are antigenically similar to those strains of the same type or subtype included in the vaccine *(86–89)*. The majority of healthy children and adults have high titers of antibody after vaccination (*87,90*). Although immune correlates such as achievement of certain antibody titers after vaccination correlate well with immunity on a population level, the significance of reaching or failing to reach a certain antibody threshold is not well understood on the individual level. Other immunologic correlates of protection that might best indicate clinical protection after receipt of an intranasal vaccine such as LAIV (e.g., mucosal antibody) are more difficult to measure (*91,92*). Laboratory measurements that correlate with protective immunity induced by LAIV have been described, including measurement of cell-mediated immunity with ELISPOT assays that measure gamma-interferon (*89*).

TABLE 1. Live, attenuated influenza vaccine (LAIV) compared with inactivated influenza vaccine (TIV) for seasonal influenza, United States formulations

Factor	LAIV	TIV
Route of administration	Intranasal spray	Intramuscular injection
Type of vaccine	Live virus	Noninfectious virus (i.e., inactivated)
No. of included virus strains	Three (two influenza A, one influenza B)	Three (two influenza A, one influenza B)
Vaccine virus strains updated	Annually	Annually
Frequency of administration	Annually*	Annually*
Approved age	Persons aged 2–49 yrs†	Persons aged ≥6 mos
Interval between 2 doses recommended for children aged ≥6 mos – 8 yrs who are receiving influenza vaccine for the first time	4 wks	4 wks
Can be administered to persons with medical risk factors for influenza-related complications†	No	Yes
Can be administered to children with asthma or children aged 2–4 yrs with wheezing in the past year§	No	Yes
Can be administered to family members or close contacts of immunosuppressed persons not requiring a protected environment	Yes	Yes
Can be administered to family members or close contacts of immunosuppressed persons requiring a protected environment (e.g., hematopoietic stem cell transplant recipient)	No	Yes
Can be administered to family members or close contacts of persons at high risk but not severely immunosuppressed	Yes	Yes
Can be simultaneously administered with other vaccines	Yes¶	Yes**
If not simultaneously administered, can be administered within 4 wks of another live vaccine	Space 4 wks apart	Yes
If not simultaneously administered, can be administered within 4 wks of an inactivated vaccine	Yes	Yes

* Children aged 6 months–8 years who have never received influenza vaccine before should receive 2 doses. Those who only receive 1 dose in their first year of vaccination should receive 2 doses in the following year, spaced 4 weeks apart.

† Persons at higher risk for complications of influenza infection because of underlying medical conditions should not receive LAIV. Persons at higher risk for complications of influenza infection because of underlying medical conditions include adults and children with chronic disorders of the pulmonary or cardiovascular systems; adults and children with chronic metabolic diseases (including diabetes mellitus), renal dysfunction, hemoglobinopathies, or immunnosuppression; children and adolescents receiving long-term aspirin therapy (at risk for developing Reye syndrome after wild-type influenza infection); persons who have any condition (e.g., cognitive dysfunction, spinal cord injuries, seizure disorders, or other neuromuscular disorders) that can compromise respiratory function or the handling of respiratory secretions or that can increase the risk for aspiration; pregnant women; and residents of nursing homes and other chronic-care facilities that house persons with chronic medical conditions.

§ Clinicians and immunization programs should screen for possible reactive airways diseases when considering use of LAIV for children aged 2–4 years and should avoid use of this vaccine in children with asthma or a recent wheezing episode. Health-care providers should consult the medical record, when available, to identify children aged 2–4 years with asthma or recurrent wheezing that might indicate asthma. In addition, to identify children who might be at greater risk for asthma and possibly at increased risk for wheezing after receiving LAIV, parents or caregivers of children aged 2–4 years should be asked: "In the past 12 months, has a health-care provider ever told you that your child had wheezing or asthma?" Children whose parents or caregivers answer "yes" to this question and children who have asthma or who had a wheezing episode noted in the medical record during the preceding 12 months should not receive LAIV.

¶ LAIV coadministration has been evaluated systematically only among children aged 12–15 months who received measles, mumps, and rubella vaccine or varicella vaccine.

** TIV coadministration has been evaluated systematically only among adults who received pneumococcal polysaccharide or zoster vaccine.

Immunogenicity, Efficacy, and Effectiveness of TIV

Children

Children aged ≥6 months typically have protective levels of anti-influenza antibody against specific influenza virus strains after receiving the recommended number of doses of influenza vaccine *(85 90 93–97).* In most seasons, one or more vaccine antigens are changed compared with the previous season. In consecutive years when vaccine antigens change, children aged <9 years who received only 1 dose of vaccine in their first year of vaccination are less likely to have protective antibody responses when administered only a single dose during their second year of vaccination compared with children who received 2 doses in their first year of vaccination (*98–100*).

When the vaccine antigens do not change from one season to the next, priming children aged 6–23 months with a single dose of vaccine in the spring followed by a dose in the fall engenders similar antibody responses compared with a regimen of 2 doses in the fall (*101*). However, one study conducted during a season when the vaccine antigens did not change compared with the previous season estimated 62% effectiveness against ILI for healthy children who had received only 1 dose in the previous influenza season and only 1 dose in the study season compared with 82% for those who received 2 doses separated by >4 weeks during the study season (*102*).

The antibody response among children at higher risk for influenza-related complications (e.g., children with chronic medical conditions) might be lower than those reported typically among healthy children (*103,104*). However, antibody responses among children with asthma are similar to those of healthy children and are not substantially altered during asthma exacerbations requiring short-term prednisone treatment (*105*).

Vaccine effectiveness studies also have indicated that 2 doses are needed to provide adequate protection during the first season that young children are vaccinated. Among children aged <5 years who have never received influenza vaccine previously or who received only 1 dose of influenza vaccine in their first year of vaccination, vaccine effectiveness is lower compared with children who received 2 doses in their first year of being vaccinated. Two large retrospective studies of young children who had received only 1 dose of TIV in their first year of being vaccinated determined that no decrease was observed in ILI-related office visits compared with unvaccinated children (*102,106*). Similar results were reported in a case-control study of children aged 6–59 months (*107*). These results, along with the immunogenicity data indicating that antibody responses are significantly higher when young children are given 2 doses, are the basis for the recommendation that all children aged <9 years who are being vaccinated for the first time should receive 2 vaccine doses separated by at least 4 weeks.

Estimates of vaccine efficacy or effectiveness among children aged ≥6 months have varied by season and study design. In a randomized trial conducted during five influenza seasons (1985–1990) in the United States among children aged 1–15 years, annual vaccination reduced laboratory-confirmed influenza A substantially (77%–91%) (*87*). A limited 1-year placebo-controlled study reported vaccine efficacy against laboratory-confirmed influenza illness of 56% among healthy children aged 3–9 years and 100% among healthy children and adolescents aged 10–18 years (*108*). A randomized, double-blind, placebo-controlled trial conducted during two influenza seasons among children aged 6–24 months indicated that efficacy was 66% against culture-confirmed influenza illness during the 1999–00 influenza season but did not reduce culture-confirmed influenza illness significantly during the 2000–20 influenza season (*109*).

A case-control study conducted during the 2003–04 season found vaccine effectiveness of 49% against laboratory-confirmed influenza (*107*). An observational study among children aged 6–59 months with laboratory-confirmed influenza compared with children who tested negative for influenza reported vaccine effectiveness of 44% in the 2003–04 influenza season and 57% during the 2004–05 season (*110*). Partial vaccination (only 1 dose for children being vaccinated for the first time) was not effective in either study. During an influenza season (2003–04) with a suboptimal vaccine match, a retrospective cohort study conducted among approximately 30,000 children aged 6 months–8 years indicated vaccine effectiveness of 51% against medically attended, clinically diagnosed pneumonia or influenza (i.e., no laboratory confirmation of influenza) among fully vaccinated children and 49% among approximately 5,000 children aged 6–23 months (*106*). Another retrospective cohort study of similar size conducted during the same influenza season in Denver but limited to healthy children aged 6–21 months estimated clinical effectiveness of 2 TIV doses to be 87% against pneumonia or influenza-related office visits (*102*). Among children, TIV effectiveness might increase with age (*87,111*). A systematic review of published studies estimated vaccine effectiveness at 59% for children aged >2 years but concluded that additional evidence was needed to demonstrate effectiveness among children aged 6 months–2 years (*112*).

Because of the recognized influenza-related disease burden among children with other chronic diseases or immunosuppression and the long-standing recommendation for vaccination of these children, randomized placebo-controlled studies to study efficacy in these children have not been conducted. In a nonrandomized controlled trial among children aged 2–6

years and 7–14 years who had asthma, vaccine efficacy was 54% and 78% against laboratory-confirmed influenza type A infection and 22% and 60% against laboratory-confirmed influenza type B infection, respectively. Vaccinated children aged 2–6 years with asthma did not have substantially fewer type B influenza virus infections compared with the control group in this study (*113*). The association between vaccination and prevention of asthma exacerbations is unclear. One study suggested that vaccination might provide protection against asthma exacerbations (*114*); however, other studies of children with asthma have not demonstrated decreased exacerbations (*115*).

TIV has been demonstrated to reduce acute otitis media in some studies. Two studies have reported that TIV decreases the risk for influenza-related otitis media by approximately 30% among children with mean ages of 20 and 27 months, respectively (*116,117*). However, a large study conducted among children with a mean age of 14 months indicated that TIV was not effective against acute otitis media (*109*). Influenza vaccine effectiveness against a nonspecific clinical outcome such as acute otitis media, which is caused by a variety of pathogens and is not typically diagnosed using influenza virus culture, would be expected to be relatively low.

Adults Aged <65 Years

One dose of TIV is highly immunogenic in healthy adults aged <65 years. Limited or no increase in antibody response is reported among adults when a second dose is administered during the same season (*118–120*). When the vaccine and circulating viruses are antigenically similar, TIV prevents laboratory-confirmed influenza illness among approximately 70%–90% of healthy adults aged <65 years in randomized controlled trials (*121–124*). Vaccination of healthy adults also has resulted in decreased work absenteeism and decreased use of health-care resources, including use of antibiotics, when the vaccine and circulating viruses are well-matched (*121–123*). Efficacy or effectiveness against laboratory-confirmed influenza illness was 47%–77% in studies conducted during different influenza seasons when the vaccine strains were antigenically dissimilar to the majority of circulating strains (*117,119,121–124*). However, effectiveness among healthy adults against influenza-related hospitalization, measured in the most recent of these studies, was 90% (*125*).

In certain studies, persons with certain chronic diseases have lower serum antibody responses after vaccination compared with healthy young adults and can remain susceptible to influenza virus infection and influenza-related upper respiratory tract illness (*126,127*). Vaccine effectiveness among adults aged <65 years who are at higher risk for influenza complications typically is lower than that reported for healthy adults. In a case-control study conducted during the 2003–04 influenza season, when the vaccine was a suboptimal antigenic match to many circulating virus strains, effectiveness for prevention of laboratory-confirmed influenza illness among adults aged 50–64 years with high-risk conditions was 48% compared with 60% for healthy adults (*125*). Effectiveness against hospitalization among adults aged 50–64 years with high-risk conditions was 36% compared with 90% effectiveness among healthy adults in that age range (*125*). A randomized controlled trial among adults in Thailand with chronic obstructive pulmonary disease (median age: 68 years) indicated a vaccine effectiveness of 76% in preventing laboratory-confirmed influenza during a season when viruses were well-matched to vaccine viruses. Effectiveness did not decrease with increasing severity of underlying lung disease (*128*).

Few randomized controlled trials have studied the effect of influenza vaccination on noninfluenza outcomes. A randomized controlled trial conducted in Argentina among 301 adults hospitalized with myocardial infarction or undergoing angioplasty for cardiovascular disease (56% of whom were aged ≥65 years) found that a significantly lower percentage (6%) of cardiovascular deaths occurred among vaccinated persons at 1 year after vaccination compared with unvaccinated persons (17%) (*129*). A randomized, double-blind, placebo-controlled study conducted in Poland among 658 persons with coronary artery disease indicated that significantly fewer vaccinated persons vaccinated persons had a cardiac ischemic event during the 9 months of follow up compared with unvaccinated persons ($p < 0.05$) (*130*).

Observational studies that have measured clinical endpoints without laboratory confirmation of influenza virus infection, typically have demonstrated substantial reductions in hospitalizations or deaths among adults with risk factors for influenza complications. In a case-control study conducted during 1999–2000 in Denmark among adults aged <65 years with underlying medical conditions, vaccination reduced deaths attributable to any cause 78% and reduced hospitalizations attributable to respiratory infections or cardiopulmonary diseases 87% (*131*). A benefit was reported after the first vaccination and increased with subsequent vaccinations in subsequent years (*132*). Among patients with diabetes mellitus, vaccination was associated with a 56% reduction in any complication, a 54% reduction in hospitalizations, and a 58% reduction in deaths (*133*). Certain experts have noted that the substantial effects on morbidity and mortality among those who received influenza vaccination in these observational studies should be interpreted with caution because of the difficulties in ensuring that those who received vaccination had similar baseline health status as those who did not (*82,83*). One meta-analysis of published studies concluded that evidence was insufficient to

demonstrate that persons with asthma benefit from vaccination (*134*). However, a meta-analysis that examined effectiveness among persons with chronic obstructive pulmonary disease identified evidence of benefit from vaccination (*135*).

Immunocompromised Persons

TIV produces adequate antibody concentrations against influenza among vaccinated HIV-infected persons who have minimal AIDS-related symptoms and normal or near-normal CD4+ T-lymphocyte cell counts (*136–138*). Among persons who have advanced HIV disease and low CD4+ T-lymphocyte cell counts, TIV might not induce protective antibody titers (*138,139*); a second dose of vaccine does not improve the immune response in these persons (*139,140*). A randomized, placebo-controlled trial determined that TIV was highly effective in preventing symptomatic, laboratory-confirmed influenza virus infection among HIV-infected persons with a mean of 400 CD4+ T-lymphocyte cells/mm3; however, a limited number of persons with CD4+ T-lymphocyte cell counts of <200 were included in that study (*140*). A nonrandomized study of HIV-infected persons determined that influenza vaccination was most effective among persons with >100 CD4+ cells and among those with <30,000 viral copies of HIV type-1/mL (*53*).

On the basis of certain limited studies, immunogenicity for persons with solid organ transplants varies according to transplant type. Among persons with kidney or heart transplants, the proportion who developed seroprotective antibody concentrations was similar or slightly reduced compared with healthy persons (*141–143*). However, a study among persons with liver transplants indicated reduced immunologic responses to influenza vaccination (*144–146*), especially if vaccination occurred within the 4 months after the transplant procedure (*144*).

Pregnant Women and Neonates

Pregnant women have protective levels of anti-influenza antibodies after vaccination (*147,148*). Passive transfer of anti-influenza antibodies that might provide protection from vaccinated women to neonates has been reported (*147,149–151*). A retrospective, clinic-based study conducted during 1998–2003 documented a nonsignificant trend toward fewer episodes of MAARI during one influenza season among vaccinated pregnant women compared with unvaccinated pregnant women and substantially fewer episodes of MAARI during the peak influenza season (*148*). However, a retrospective study conducted during 1997–2002 that used clinical records data did not indicate a reduction in ILI among vaccinated pregnant women or their infants (*152*). In another study conducted during 1995–2001, medical visits for respiratory illness among the infants were not substantially reduced (*153*). One randomized controlled trial conducted in Bangladesh that provided vaccination to pregnant women during the third trimester demonstrated a 29% reduction in respiratory illness with fever and a 36% reduction in respiratory illness with fever among their infants during the first 6 months after birth. In addition, infants born to vaccinated women had a 63% reduction in laboratory-confirmed influenza illness during the first 6 months of life (*154*). All women in this trial breastfed their infants (mean duration: 14 weeks).

Older Adults

Adults aged ≥65 years typically have a diminished immune response to influenza vaccination compared with young healthy adults, suggesting that immunity might be of shorter duration (although still extending through one influenza season) (*155,156*). However, a review of the published literature concluded that no clear evidence existed that immunity declined more rapidly in the elderly (*157*), and additional vaccine doses during the same season do not increase the antibody response (*118,120*). Infections among the vaccinated elderly might be associated with an age-related reduction in ability to respond to vaccination rather than reduced duration of immunity (*127,128*). One prospective cohort study found that immunogenicity among hospitalized persons who were either aged ≥65 years or who were aged 18–64 years and had one or more chronic medical conditions was similar compared with outpatients (*158*).

The only randomized controlled trial among community-dwelling persons aged ≥60 years reported a vaccine efficacy of 58% (CI = 26%–77%) against laboratory-confirmed influenza illness during a season when the vaccine strains were considered to be well-matched to circulating strains (*159*). Additional information from this trial published separately indicated that efficacy among those aged ≥70 years was 57% (CI = -36%–87%), similar to younger persons. However, few persons aged >75 years participated in this study, and the wide confidence interval for the estimate of efficacy among participants aged ≥70 years included 0 (*160*). Influenza vaccine effectiveness in preventing MAARI among the elderly in nursing homes has been estimated at 20%–40% (*161,162*), and reported outbreaks among well-vaccinated nursing home populations have suggested that vaccination might not have any significant effectiveness when circulating strains are drifted from vaccine strains (*163,164*). In contrast, some studies have indicated that vaccination can be up to 80% effective in preventing influenza-related death (*161,165–167*). Among elderly persons not living in nursing homes or similar long-term–care facilities, influenza

vaccine is 27%–70% effective in preventing hospitalization for pneumonia and influenza (*168–170*). Influenza vaccination reduces the frequency of secondary complications and reduces the risk for influenza-related hospitalization and death among community-dwelling adults aged ≥65 years with and without high-risk medical conditions (e.g., heart disease and diabetes) (*169–174*). However, studies demonstrating large reductions in hospitalizations and deaths among the vaccinated elderly have been conducted using medical record databases and have not measured reductions in laboratory-confirmed influenza illness. These studies have been challenged because of concerns that they have not adequately controlled for differences in the propensity for healthier persons to be more likely than less healthy persons to receive vaccination (*82,83,166,175–177*).

TIV Dosage, Administration, and Storage

The composition of TIV varies according to manufacturer, and package inserts should be consulted. TIV formulations in multidose vials contain the vaccine preservative thimerosal; preservative-free, single-dose preparations also are available. TIV should be stored at 35°F–46°F (2°C–8°C) and should not be frozen. TIV that has been frozen should be discarded. Dosage recommendations and schedules vary according to age group (Table 2). Vaccine prepared for a previous influenza season should not be administered to provide protection for any subsequent season.

The intramuscular route is recommended for TIV. Adults and older children should be vaccinated in the deltoid muscle. A needle length of ≥1 inch (>25 mm) should be considered for persons in these age groups because needles of <1 inch might be of insufficient length to penetrate muscle tissue in certain adults and older children (*178*). When injecting into the deltoid muscle among children with adequate deltoid muscle mass, a needle length of 7/8–1.25 inches is recommended (*179*).

Infants and young children should be vaccinated in the anterolateral aspect of the thigh. A needle length of 7/8–1 inch should be used for children aged <12 months.

TABLE 2. Approved influenza vaccines for different age groups — United States, 2009–10 season

Vaccine	Trade name	Manufacturer	Presentation	Mercury content (mcg Hg/0.5 mL dose)	Age group	No. of doses	Route
TIV*	Fluzone	Sanofi Pasteur	0.25mL prefilled syringe	0	6–35 mos	1 or 2†	Intramuscular§
			0.5 mL prefilled syringe	0	≥36 mos	1 or 2	Intramuscular
			0.5 mL vial	0	≥36 mos	1 or 2	Intramuscular
			5.0 mL multidose vial	25	≥6 mos	1 or 2	Intramuscular
TIV	Fluvirin	Novartis Vaccine	5.0 mL multidose vial	24.5	≥4 yrs	1 or 2	Intramuscular
TIV	Fluarix	GlaxoSmithKline	0.5 mL prefilled syringe	<1.0	≥18 yrs	1	Intramuscular
TIV	FluLaval	GlaxoSmithKline	5.0 mL multidose vial	25	≥18 yrs	1	Intramuscular
TIV	Afluria	CSL Biotherapies	0.5 mL prefilled syringe	0	≥18 yrs	1	Intramuscular
			5.0 mL multidose vial	25			
LAIV¶	FluMist**	MedImmune	0.2 mL sprayer	0	2–49 yrs	1 or 2††	Intranasal

* Trivalent inactivated vaccine. A 0.5-mL dose contains 15 mcg each of A/Brisbane/59/2007 (H1N1)-like, A/Brisbane/10/2007 (H3N2)-like, and B/Brisbane/60/2008-like antigens.

† Two doses administered at least 1 month apart are recommended for children aged 6 months–8 years who are receiving TIV for the first time and those who only received 1 dose in their first year of vaccination should receive 2 doses in the following year.

§ For adults and older children, the recommended site of vaccination is the deltoid muscle. The preferred site for infants and young children is the anterolateral aspect of the thigh.

¶ Live attenuated influenza vaccine. A 0.2-mL dose contains $10^{6.5–7.5}$ fluorescent focal units of live attenuated influenza virus reassortants of each of the three strains for the 2008–09 influenza season: A/Brisbane/59/2007(H1N1), A/Brisbane/10/2007(H3N2), and B/Brisbane/60/2008.

** FluMist is shipped refrigerated and stored in the refrigerator at 2°C–8°C (36°F to 46°F) after arrival in the immunization clinic. The dose is 0.2 mL divided equally between each nostril. FluMist should not be administered to persons with asthma. Health-care providers should consult the medical record, when available, to identify children aged 2–4 years with asthma or recurrent wheezing that might indicate asthma. In addition, to identify children who might be at greater risk for asthma and possibly at increased risk for wheezing after receiving FluMist, parents or caregivers of children aged 2–4 years should be asked: "In the past 12 months, has a health-care provider ever told you that your child had wheezing or asthma?" Children whose parents or caregivers answer "yes" to this question and children who have asthma or who had a wheezing episode noted in the medical record during the preceding 12 months should not receive FluMist.

†† Two doses administered at least 4 weeks apart are recommended for children aged 2–8 years who are receiving LAIV for the first time, and those who only received 1 dose in their first year of vaccination should receive 2 doses in the following year.

Adverse Events After Receipt of TIV

Children

Studies support the safety of annual TIV in children and adolescents. The largest published postlicensure population-based study assessed TIV safety in 251,600 children aged <18 years, (including 8,476 vaccinations in children aged 6–23 months) through the Vaccine Safety Datalink (VSD), who were enrolled in one of five health maintenance organizations (HMOs) during 1993–1999. This study indicated no increase in clinically important medically attended events during the 2 weeks after inactivated influenza vaccination compared with control periods 3–4 weeks before and after vaccination (*180*). A retrospective cohort study using VSD medical records data from 45,356 children aged 6–23 months provided additional evidence supporting overall safety of TIV in this age group. During the 2 weeks after vaccination, TIV was not associated with statistically significant increases in any clinically important medically attended events other than gastritis/duodenitis, and 13 diagnoses, including acute upper respiratory illness, otitis media and asthma, were significantly less common (*181*). On chart review, most children with a diagnosis of gastritis/duodenitis had self-limited vomiting or diarrhea. The positive or negative associations between TIV and any of these diagnoses do not necessarily indicate a causal relationship (*181*).

In a study of 791 healthy children aged 1–15 years, postvaccination fever was noted among 12% of those aged 1–5 years, 5% among those aged 6–10 years, and 5% among those aged 11–15 years (*87*). Fever, malaise, myalgia, and other systemic symptoms that can occur after vaccination with inactivated vaccine most often affect persons who have had no previous exposure to the influenza virus antigens in the vaccine (e.g., young children) (*182,183*). These reactions begin 6–12 hours after vaccination and can persist for 1–2 days. Data about potential adverse events among children after influenza vaccination are available from the Vaccine Adverse Event Reporting System (VAERS). Because of the limitations of passive reporting systems, determining causality for specific types of adverse events usually is not possible using VAERS data alone.

Published reviews of VAERS reports submitted after administration of TIV to children aged 6–23 months indicated that the most frequently reported adverse events were fever, rash, injection-site reactions, and seizures; the majority of the limited number of reported seizures appeared to be febrile (*184,185*). Seizure and fever were the leading serious adverse events (SAEs), defined using standard criteria, reported to VAERS in these studies (*184,185*); further investigation in VSD did not confirm an association with febrile seizures as identified in VAERS (*181*).

Adults

In placebo-controlled studies among adults, the most frequent side effect of vaccination was soreness at the vaccination site (affecting 10%–64% of patients) that lasted <2 days (*186,187*). These local reactions typically were mild and rarely interfered with the recipients' ability to conduct usual daily activities. Placebo-controlled trials demonstrate that among older persons and healthy young adults, administration of TIV is not associated with higher rates for systemic symptoms (e.g., fever, malaise, myalgia, and headache) when compared with placebo injections (*121,134,186–188*). One prospective cohort study found that the rate of adverse events was similar among hospitalized persons who either were aged ≥65 years or were aged 18–64 years and had one or more chronic medical conditions compared with outpatients (*158*). Adverse events in adults aged ≥18 years reported to VAERS during 1990–2005 were analyzed. The most common adverse events reported to VAERS in adults included injection-site reactions, pain, fever, myalgia, and headache. The VAERS review identified no new safety concerns. In clinical trials, SAEs were reported to occur after vaccination with TIV at a rate of <1%. A small proportion (14%) of the TIV VAERS reports in adults were classified as SAEs, without assessment of causality. The most common SAE reported after TIV in VAERS in adults was Guillain-Barré Syndrome (GBS) (*189*). The potential association between TIV and GBS has been an area of ongoing research (see Guillain-Barré Syndrome and TIV).

Pregnant Women and Neonates

FDA has classified TIV as a "Pregnancy Category C" medication, indicating that adequate animal reproduction studies have not been conducted.. Available data indicate that influenza vaccine does not cause fetal harm when administered to a pregnant woman or affect reproductive capacity. One study of approximately 2,000 pregnant women who received TIV during pregnancy demonstrated no adverse fetal effects and no adverse effects during infancy or early childhood (*190*). A matched case-control study of 252 pregnant women who received TIV within the 6 months before delivery determined no adverse events after vaccination among pregnant women and no difference in pregnancy outcomes compared with 826 pregnant women who were not vaccinated (*148*). During 2000–2003, an estimated 2 million pregnant women were vaccinated, and only 20 adverse events among women who received TIV were reported to VAERS during this time, including nine injection-site reactions and eight systemic reactions (e.g., fever, headache, and myalgias). In addition, three miscarriages were reported, but these were not known to be causally related to vaccination (*191*). Similar results have been

reported in certain smaller studies (*147,149,192*), and a recent international review of data on the safety of TIV concluded that no evidence exists to suggest harm to the fetus (*193*). The rate of adverse events associated with TIV was similar to the rate of adverse events among pregnant women who received pneumococcal polysaccharide vaccine in one small randomized controlled trial in Bangladesh, and no severe adverse events were reported in any study group (*154*).

Persons with Chronic Medical Conditions

In a randomized cross-over study of children and adults with asthma, no increase in asthma exacerbations was reported for either age group (*194*), and two additional studies also have indicated no increase in wheezing among vaccinated asthmatic children (*114*) or adults (*195*). One study reported that 20%–28% of children with asthma aged 9 months–18 years had local pain and swelling at the site of influenza vaccination (*104*), and another study reported that 23% of children aged 6 months–4 years with chronic heart or lung disease had local reactions (*93*). A blinded, randomized, cross-over study of 1,952 adults and children with asthma demonstrated that only self-reported "body aches" were reported more frequently after TIV (25%) than placebo-injection (21%) (*194*). However, a placebo-controlled trial of TIV indicated no difference in local reactions among 53 children aged 6 months–6 years with high-risk medical conditions or among 305 healthy children aged 3–12 years (*97*).

Among children with high-risk medical conditions, one study of 52 children aged 6 months–3 years reported fever among 27% and irritability and insomnia among 25% (*93*); and a study among 33 children aged 6–18 months reported that one child had irritability and one had a fever and seizure after vaccination (*196*). No placebo comparison group was used in these studies.

Immunocompromised Persons

Data demonstrating safety of TIV for HIV-infected persons are limited, but no evidence exists that vaccination has a clinically important impact on HIV infection or immunocompetence. One study demonstrated a transient (i.e., 2–4 week) increase in HIV RNA (ribonucleic acid) levels in one HIV-infected person after influenza virus infection (*197*). Studies have demonstrated a transient increase in replication of HIV-1 in the plasma or peripheral blood mononuclear cells of HIV-infected persons after vaccine administration (*138,198*). However, more recent and better-designed studies have not documented a substantial increase in the replication of HIV (*199–202*). CD4+ T-lymphocyte cell counts or progression of HIV disease have not been demonstrated to change substantially after influenza vaccination among HIV-infected persons compared with unvaccinated HIV-infected persons (*138,203*). Limited information is available about the effect of antiretroviral therapy on increases in HIV RNA levels after either natural influenza virus infection or influenza vaccination (*52,204*).

Data are similarly limited for persons with other immunocompromising conditions. In small studies, vaccination did not affect allograft function or cause rejection episodes in recipients of kidney transplants (*141,142*), heart transplants (*143*), or liver transplants (*144*).

Immediate Hypersensitivity Reactions after Influenza Vaccines

Vaccine components can rarely cause allergic reactions, also called immediate hypersensitivity reactions, among certain recipients. Immediate hypersensitivity reactions are mediated by preformed immunoglobulin E (IgE) antibodies against a vaccine component and usually occur within minutes to hours of exposure (*205*). Symptoms of immediate hypersensitivity range from mild urticaria (hives) and angioedema to anaphylaxis. Anaphylaxis is a severe life-threatening reaction that involves multiple organ systems and can progress rapidly. Symptoms and signs of anaphylaxis can include but are not limited to generalized urticaria, wheezing, swelling of the mouth and throat, difficulty breathing, vomiting, hypotension, decreased level of consciousness, and shock. Minor symptoms such as red eyes or hoarse voice also might be present (*179,205–208*).

Allergic reactions might be caused by the vaccine antigen, residual animal protein, antimicrobial agents, preservatives, stabilizers, or other vaccine components (*209*). Manufacturers use a variety of compounds to inactivate influenza viruses and add antibiotics to prevent bacterial growth. Package inserts for specific vaccines of interest should be consulted for additional information. ACIP has recommended that all vaccine providers should be familiar with the office emergency plan and be certified in cardiopulmonary resuscitation (*179*). The Clinical Immunization Safety Assessment (CISA) network, a collaboration between CDC and six medical research centers with expertise in vaccination safety, has developed an algorithm to guide evaluation and revaccination decisions for persons with suspected immediate hypersensitivity after vaccination (*205*).

Immediate hypersensitivity reaction after TIV and LAIV are rare. A VSD study of children aged <18 years in four HMOs during 1991–1997 estimated the overall risk of postvaccination anaphylaxis to be less than 1 case per 500,000 doses administered and in this study no cases were identified in TIV recipients (*210*). Reports of anaphylaxis occurring after

receipt of TIV and LAIV in adults have rarely been reported to VAERS (*189*).

Some immediate hypersensitivity reactions after TIV or LAIV are caused by the presence of residual egg protein in the vaccines (*211*). Although influenza vaccines contain only a limited quantity of egg protein, this protein can induce immediate hypersensitivity reactions among persons who have severe egg allergy. Asking persons if they can eat eggs without adverse effects is a reasonable way to determine who might be at risk for allergic reactions from receiving influenza vaccines (*179*). Persons who have had symptoms such as hives or swelling of the lips or tongue, or who have experienced acute respiratory distress after eating eggs, should consult a physician for appropriate evaluation to help determine if future influenza vaccine should be administered. Persons who have documented (IgE)-mediated hypersensitivity to eggs, including those who have had occupational asthma related to egg exposure or other allergic responses to egg protein, also might be at increased risk for allergic reactions to influenza vaccine, and consultation with a physician before vaccination should be considered (*212–214*). A regimen has been developed for administering influenza vaccine to asthmatic children with severe disease and egg hypersensitivity (*213*).

Hypersensitivity reactions to other vaccine components also can rarely occur. Although exposure to vaccines containing thimerosal can lead to hypersensitivity (*215*), the majority of patients do not have reactions to thimerosal when it is administered as a component of vaccines, even when patch or intradermal tests for thimerosal indicate hypersensitivity (*216,217*). When reported, hypersensitivity to thimerosal typically has consisted of local delayed hypersensitivity reactions (*216*).

Ocular and Respiratory Symptoms after TIV

Ocular or respiratory symptoms have occasionally been reported within 24 hours after TIV administration, but these symptoms typically are mild and resolve quickly without specific treatment. In some trials conducted in the United States, ocular or respiratory symptoms included red eyes (<1%–6%), cough (1%–7%), wheezing (1%), and chest tightness (1%–3%) (*207,208,218–220*). However, most of these trials were not placebo-controlled, and causality cannot be determined. In addition, ocular and respiratory symptoms are features of a variety of respiratory illnesses and seasonal allergies that would be expected to occur coincidentally among vaccine recipients unrelated to vaccination. A placebo-controlled vaccine effectiveness study among young adults found that 2% of persons who received the 2006–07 formulation of Fluzone (Sanofi Pasteur) reported red eyes compared with none of the controls ($p = 0.03$) (*221*). A similar trial conducted during the 2005–06 influenza season found that 3% of Fluzone recipients reported red eyes compared with 1% of placebo recipients; however the difference was not statistically significant (*222*) .

Oculorespiratory syndrome (ORS), an acute, self-limited reaction to TIV with prominent ocular and respiratory symptoms, was first described during the 2000–01 influenza season in Canada. The initial case-definition for ORS was the onset of one or more of the following within 2–24 hours after receiving TIV: bilateral red eyes and/or facial edema and/or respiratory symptoms (coughing, wheezing, chest tightness, difficulty breathing, sore throat, hoarseness or difficulty swallowing, cough, wheeze, chest tightness, difficulty breathing, sore throat, or facial swelling) (*223*). ORS was first described in Canada and strongly associated with one vaccine preparation (Fluviral S/F, Shire Biologics, Quebec, Canada) not available in the United States during the 2000–01 influenza season (*224*). Subsequent investigations identified persons with ocular or respiratory symptoms meeting an ORS case-definition in safety monitoring systems and trials that had been conducted before 2000 in Canada, the United States, and several European countries (*225–227*).

The cause of ORS has not been established; however studies suggest the reaction is not IgE-mediated (*228*). After changes in the manufacturing process of the vaccine preparation associated with ORS during 2000–01, the incidence of ORS in Canada was greatly reduced (*226*). In one placebo-controlled study, only hoarseness, cough, and itchy or sore eyes (but not red eyes) were significantly associated with a reformulated Fluviral preparation. These findings indicated that ORS symptoms following use of the reformulated vaccine were mild, resolved within 24 hours, and might not typically be of sufficient concern to cause vaccine recipients to seek medical care (*229*).

Ocular and respiratory symptoms reported after TIV administration, including ORS, have some similarities with immediate hypersensitivity reactions. One study indicated that the risk for ORS recurrence with subsequent vaccination is low, and persons with ocular or respiratory symptoms (e.g., bilateral red eyes, cough, sore throat, or hoarseness) after TIV that did not involve the lower respiratory tract have been revaccinated without reports of SAEs after subsequent exposure to TIV (*230*). VAERS routinely monitors for adverse events such as ocular or respiratory symptoms after receipt of TIV.

Contraindications and Precautions for Use of TIV

TIV is contraindicated and should not be administered to persons known to have anaphylactic hypersensitivity to eggs or

to other components of the influenza vaccine unless the recipient has been desensitized. Prophylactic use of antiviral agents is an option for preventing influenza among such persons. Information about vaccine components is located in package inserts from each manufacturer. Persons with moderate to severe acute febrile illness usually should not be vaccinated until their symptoms have abated. Moderate or severe acute illness with or without fever is a precaution[§] for TIV. GBS within 6 weeks following a previous dose of influenza vaccine is considered to be a precaution for use of influenza vaccines.

Revaccination in Persons Who Experienced Ocular or Respiratory Symptoms After TIV

When assessing whether a patient who experienced ocular and respiratory symptoms should be revaccinated, providers should determine if concerning signs and symptoms of Ig-E mediated immediate hypersensitivity are present (see Immediate Hypersensitivity after Influenza Vaccines). Health-care providers who are unsure whether symptoms reported or observed after TIV represent an IgE-mediated hypersensitivity immune response should seek advice from an allergist/immunologist. Persons with symptoms of possible IgE-mediated hypersensitivity after TIV should not receive influenza vaccination unless hypersensitivity is ruled out or revaccination is administered under close medical supervision (*205*).

Ocular or respiratory symptoms observed after TIV often are coincidental and unrelated to TIV administration, as observed among placebo recipients in some randomized controlled studies. Determining whether ocular or respiratory symptoms are coincidental or related to possible ORS might not be possible. Persons who have had red eyes, mild upper facial swelling, or mild respiratory symptoms (e.g., sore throat, cough, or hoarseness) after TIV without other concerning signs or symptoms of hypersensitivity can receive TIV in subsequent seasons without further evaluation. Two studies showed that persons who had symptoms of ORS after TIV were at a higher risk for ORS after subsequent TIV administration; however, these events usually were milder than the first episode (*230,231*).

Guillain-Barré Syndrome and TIV

The annual incidence of GBS is 10–20 cases per 1 million adults (*232*). Substantial evidence exists that multiple infectious illnesses, most notably *Campylobacter jejuni* gastrointestinal infections and upper respiratory tract infections, are associated with GBS (*233–235*). A recent study identified serologically confirmed influenza virus infection as a trigger of GBS, with time from onset of influenza illness to GBS of 3–30 days. The estimated frequency of influenza-related GBS was four to seven times higher than the frequency that has been estimated for influenza-vaccine–associated GBS (*236*).

The 1976 swine influenza vaccine was associated with an increased frequency of GBS, estimated at one additional case of GBS per 100,000 persons vaccinated (*237,238*). The risk for influenza-vaccine–associated GBS was higher among persons aged ≥25 years than among persons aged <25 years (*239*). However, obtaining epidemiologic evidence for a small increase in risk for a rare condition with multiple causes is difficult, and no evidence consistently exists for a causal relation between subsequent vaccines prepared from other influenza viruses and GBS.

None of the studies conducted using influenza vaccines other than the 1976 swine influenza vaccine has demonstrated a substantial increase in GBS associated with influenza vaccines. During three of four influenza seasons studied during 1977–1991, the overall relative risk estimates for GBS after influenza vaccination were not statistically significant in any of these studies (*240–242*). However, in a study of the 1992–93 and 1993–94 seasons, the overall relative risk for GBS was 1.7 (CI = 1.0–2.8; p = 0.04) during the 6 weeks after vaccination, representing approximately one additional case of GBS per 1 million persons vaccinated; the combined number of GBS cases peaked 2 weeks after vaccination (*238*). Results of a study that examined health-care data from Ontario, Canada, during 1992–2004 demonstrated a small but statistically significant temporal association between receiving influenza vaccination and subsequent hospital admission for GBS. However, no increase in cases of GBS at the population level was reported after introduction of a mass public influenza vaccination program in Ontario beginning in 2000 (*243*). Data from VAERS have documented decreased reporting of GBS occurring after vaccination across age groups over time, despite overall increased reporting of other non-GBS conditions occurring after administration of influenza vaccine (*237*). Published data from the United Kingdom's General Practice Research Database (GPRD) found influenza vaccine to be associated with a decreased risk for GBS, although whether this was associated with protection against influenza or confounding because of a "healthy vaccinee" (e.g., healthier persons might be more likely to be vaccinated and also be at lower risk for GBS) (*244*) is unclear. A separate GPRD analysis found no association between vaccination and GBS for a 9-year period; only three cases of GBS occurred within 6 weeks after administration of influenza vaccine (*245*). A third GPRD analysis found that GBS was associated with recent ILI, but not influenza vaccination (*246*).

[§] A precaution is a condition in a recipient that might increase the risk for a serious adverse reaction or that might compromise the ability of the vaccine to produce immunity (*179*).

The estimated risk for GBS (on the basis of the few studies that have demonstrated an association between vaccination and GBS) is low (i.e., approximately one additional case per 1 million persons vaccinated). The potential benefits of influenza vaccination in preventing serious illness, hospitalization, and death substantially outweigh these estimates of risk for vaccine-associated GBS. No evidence indicates that the case-fatality ratio for GBS differs among vaccinated persons and those not vaccinated.

Use of TIV Among Patients with a History of GBS

The incidence of GBS among the general population is low, but persons with a history of GBS have a substantially greater likelihood of subsequently experiencing GBS than persons without such a history (*232*). Thus, the likelihood of coincidentally experiencing GBS after influenza vaccination is expected to be greater among persons with a history of GBS than among persons with no history of this syndrome. Whether influenza vaccination specifically might increase the risk for recurrence of GBS is unknown. Among 311 patients with GBS who responded to a survey, 11 (4%) reported some worsening of symptoms after influenza vaccination; however, some of these patients had received other vaccines at the same time, and recurring symptoms were generally mild (*247*). However, as a precaution, persons who are not at high risk for severe influenza complications and who are known to have experienced GBS within 6 weeks generally should not be vaccinated. As an alternative, physicians might consider using influenza antiviral chemoprophylaxis for these persons. Although data are limited, the established benefits of influenza vaccination might outweigh the risks for many persons who have a history of GBS and who also are at high risk for severe complications from influenza.

Vaccine Preservative (Thimerosal) in Multidose Vials of TIV

Thimerosal, a mercury-containing antibacterial compound, has been used as a preservative in vaccines and other medications since the 1930s (*248*) and is used in multidose vial preparations of TIV to reduce the likelihood of bacterial growth. No scientific evidence indicates that thimerosal in vaccines, including influenza vaccines, is a cause of adverse events other than occasional local hypersensitivity reactions in vaccine recipients. In addition, no scientific evidence exists that thimerosal-containing vaccines are a cause of adverse events among children born to women who received vaccine during pregnancy. The weight of accumulating evidence does not suggest an increased risk for neurodevelopment disorders from exposure to thimerosal-containing vaccines (*249–258*). The U.S. Public Health Service and other organizations have recommended that efforts be made to eliminate or reduce the thimerosal content in vaccines as part of a strategy to reduce mercury exposures from all sources (*249,250,259*) Also, continuing public concerns about exposure to mercury in vaccines has been viewed as a potential barrier to achieving higher vaccine coverage levels and reducing the burden of vaccine-preventable diseases. Since mid-2001, vaccines routinely recommended for infants aged <6 months in the United States have been manufactured either without or with greatly reduced (trace) amounts of thimerosal. As a result, a substantial reduction in the total mercury exposure from vaccines for infants and children already has been achieved (*179*)). ACIP and other federal agencies and professional medical organizations continue to support efforts to provide thimerosal-preservative–free vaccine options.

The benefits of influenza vaccination for all recommended groups, including pregnant women and young children, outweigh concerns on the basis of a theoretical risk from thimerosal exposure through vaccination. The risks for severe illness from influenza virus infection are elevated among both young children and pregnant women, and vaccination has been demonstrated to reduce the risk for severe influenza illness and subsequent medical complications. In contrast, no scientifically conclusive evidence has demonstrated harm from exposure to vaccine containing thimerosal preservative. For these reasons, persons recommended to receive TIV may receive any age- and risk factor–appropriate vaccine preparation, depending on availability. An analysis of VAERS reports found no difference in the safety profile of preservative-containing compared with preservative-free TIV vaccines in infants aged 6–23 months (*184*).

Nonetheless, as of May 2009, some states have enacted legislation banning the administration of vaccines containing mercury; the provisions defining mercury content vary (*260*). LAIV and many of the single-dose vial or syringe preparations of TIV are thimerosal-free, and the number of influenza vaccine doses that do not contain thimerosal as a preservative is expected to increase (Table 2). However, these laws might present a barrier to vaccination unless influenza vaccines that do not contain thimerosal as a preservative are easily available in those states.

The U.S. vaccine supply for infants and pregnant women is in a period of transition as manufacturers expand the availability of thimerosal-reduced or thimerosal-free vaccine to reduce the cumulative exposure of infants to mercury. Other

environmental sources of mercury exposure are more difficult or impossible to avoid or eliminate (*249*).

LAIV Dosage, Administration, and Storage

Each dose of LAIV contains the same three vaccine antigens used in TIV. However, the antigens are constituted as live, attenuated, cold-adapted, temperature-sensitive vaccine viruses. Providers should refer to the package insert, which contains additional information about the formulation of this vaccine and other vaccine components. LAIV does not contain thimerosal. LAIV is made from attenuated viruses that are able to replicate efficiently only at temperatures present in the nasal mucosa. LAIV does not cause systemic symptoms of influenza in vaccine recipients, although a minority of recipients experience nasal congestion or fever, which is probably a result of effects of intranasal vaccine administration or local viral replication or fever (*261*).

LAIV is intended for intranasal administration only and should not be administered by the intramuscular, intradermal, or intravenous route. LAIV is not licensed for vaccination of children aged <2 years or adults aged >49 years. LAIV is supplied in a prefilled, single-use sprayer containing 0.2 mL of vaccine. Approximately 0.1 mL (i.e., half of the total sprayer contents) is sprayed into the first nostril while the recipient is in the upright position. An attached dose-divider clip is removed from the sprayer to administer the second half of the dose into the other nostril. LAIV is shipped at 35°F–46°F (2°C–8°C). LAIV should be stored at 35°F–46°F (2°C–8°C) on receipt and can remain at that temperature until the expiration date is reached (*261*). Vaccine prepared for a previous influenza season should not be administered to provide protection for any subsequent season.

Shedding, Transmission, and Stability of Vaccine Viruses

Available data indicate that both children and adults vaccinated with LAIV can shed vaccine viruses after vaccination, although in lower amounts than occur typically with shedding of wild-type influenza viruses. In rare instances, shed vaccine viruses can be transmitted from vaccine recipients to unvaccinated persons. However, serious illnesses have not been reported among unvaccinated persons who have been infected inadvertently with vaccine viruses.

One study of 197 children aged 8–36 months in a child care center assessed transmissibility of vaccine viruses from 98 vaccinated children to the other 99 unvaccinated children; 80% of vaccine recipients shed one or more virus strains (mean duration: 7.6 days). One influenza type B vaccine strain isolate was recovered from a placebo recipient and was confirmed to be vaccine-type virus. The type B isolate retained the cold-adapted, temperature-sensitive, attenuated phenotype, and it possessed the same genetic sequence as a virus shed from a vaccine recipient who was in the same play group. The placebo recipient from whom the influenza type B vaccine strain was isolated had symptoms of a mild upper respiratory illness but did not experience any serious clinical events. The estimated probability of acquiring vaccine virus after close contact with a single LAIV recipient in this child care population was 1%–2% (*262*).

Studies assessing whether vaccine viruses are shed have been based on viral cultures or PCR detection of vaccine viruses in nasal aspirates from persons who have received LAIV. Among 345 subjects aged 5–49 years, 30% had detectable virus in nasal secretions obtained by nasal swabbing after receiving LAIV. The duration of virus shedding and the amount of virus shed was inversely correlated with age, and maximal shedding occurred within 2 days of vaccination. Symptoms reported after vaccination, including runny nose, headache, and sore throat, did not correlate with virus shedding (*263*). Other smaller studies have reported similar findings (*264,265*). Vaccine strain virus was detected from nasal secretions in one (2%) of 57 HIV-infected adults who received LAIV, none of 54 HIV-negative participants (*266*), and three (13%) of 23 HIV-infected children compared with seven (28%) of 25 children who were not HIV-infected (*267*). No participants in these studies had detectable virus beyond 10 days after receipt of LAIV. The possibility of person-to-person transmission of vaccine viruses was not assessed in these studies (*264–267*).

In clinical trials, viruses isolated from vaccine recipients have retained attenuated phenotypes. In one study, nasal and throat swab specimens were collected from 17 study participants for 2 weeks after vaccine receipt (*268*). Virus isolates were analyzed by multiple genetic techniques. All isolates retained the LAIV genotype after replication in the human host, and all retained the cold-adapted and temperature-sensitive phenotypes. A study conducted in a child care setting demonstrated that limited genetic change occurred in the LAIV strains following replication in the vaccine recipients (*269*).

Immunogenicity, Efficacy, and Effectiveness of LAIV

LAIV virus strains replicate primarily in nasopharyngeal epithelial cells. The protective mechanisms induced by vaccination with LAIV are not understood completely but appear to involve both serum and nasal secretory antibodies. The immunogenic-

ity of the approved LAIV has been assessed in multiple studies conducted among children and adults (*270–276*).

Healthy Children

A randomized, double-blind, placebo-controlled trial among 1,602 healthy children aged 15–71 months assessed the efficacy of LAIV against culture-confirmed influenza during two seasons (*277,278*). This trial included a subset of children aged 60–71 months who received 2 doses in the first season. During season one (1996–97), when vaccine and circulating virus strains were well-matched, efficacy against culture-confirmed influenza was 94% for participants who received 2 doses of LAIV separated by ≥6 weeks, and 89% for those who received 1 dose. During season two (1997–98), when the A (H3N2) component in the vaccine was not well-matched with circulating virus strains, efficacy (1 dose) was 86%, for an overall efficacy for two influenza seasons of 92%. Receipt of LAIV also resulted in 21% fewer febrile illnesses and a significant decrease in acute otitis media requiring antibiotics (*277,279*). Other randomized, placebo-controlled trials demonstrating the efficacy of LAIV in young children against culture-confirmed influenza include a study conducted among children aged 6–35 months attending child care centers during consecutive influenza seasons (*280*) in which 85%–89% efficacy was observed, and a study conducted among children aged 12–36 months living in Asia during consecutive influenza seasons in which 64%–70% efficacy was documented (*281*). In one community-based, nonrandomized open-label study, reductions in MAARI were observed among children who received 1 dose of LAIV during the 1990–00 and 2000–01 influenza seasons even though antigenically drifted influenza A/H1N1 and B viruses were circulating during that season (*282*). LAIV efficacy in preventing laboratory-confirmed influenza also has been demonstrated in studies comparing the efficacy of LAIV with TIV rather than with a placebo (see Comparisons of LAIV and TIV Efficacy or Effectiveness).

Healthy Adults

A randomized, double-blind, placebo-controlled trial of LAIV effectiveness among 4,561 healthy working adults aged 18–64 years assessed multiple endpoints, including reductions in self-reported respiratory tract illness without laboratory confirmation, work loss, health-care visits, and medication use during influenza outbreak periods . The study was conducted during the 1997–98 influenza season, when the vaccine and circulating A (H3N2) strains were not well-matched. The frequency of febrile illnesses was not significantly decreased among LAIV recipients compared with those who received placebo. However, vaccine recipients had significantly fewer severe febrile illnesses (19% reduction) and febrile upper respiratory tract illnesses (24% reduction), and significant reductions in days of illness, days of work lost, days with health-care–provider visits, and use of prescription antibiotics and over-the-counter medications (*283*). Efficacy against culture-confirmed influenza in a randomized, placebo-controlled study was 57% in the 2004–05 influenza season and 43% in the 2005–06 influenza season, although efficacy in these studies was not demonstrated to be significantly greater than placebo (*221,222*).

Adverse Events after Receipt of LAIV

Healthy Children Aged 2–18 Years

In a subset of healthy children aged 60–71 months from one clinical trial, certain signs and symptoms were reported more often after the first dose among LAIV recipients (n = 214) than among placebo recipients (n = 95), including runny nose (48% and 44%, respectively); headache (18% and 12%, respectively); vomiting (5% and 3%, respectively); and myalgias (6% and 4%, respectively) (*277*). However, these differences were not statistically significant. In other trials, signs and symptoms reported after LAIV administration have included runny nose or nasal congestion (20%–75%), headache (2%–46%), fever (0–26%), vomiting (3%–13%), abdominal pain (2%), and myalgias (0–21%) (*270,272,273,280,284–287*). These symptoms were associated more often with the first dose and were self-limited. A placebo-controlled trial in 9,689 children aged 1–17 years assessed prespecified medically attended outcomes during the 42 days after vaccination (*286*). Following >1,500 statistical analyses in the 42 days after LAIV, elevated risks that were biologically plausible were observed for the following conditions: asthma, upper respiratory infection, musculoskeletal pain, otitis media with effusion, and adenitis/adenopathy. The increased risk for wheezing events after LAIV was observed among children aged 18–35 months (RR: 4.06; 90% CI = 1.3–17.9). In this study, the rate of SAEs was 0.2% in LAIV and placebo recipients; none of the SAEs was judged to be related to the vaccine by the study investigators (*286*).

In a randomized trial published in 2007, LAIV and TIV were compared among children aged 6–59 months (*288*). Children with medically diagnosed or treated wheezing within 42 days before enrollment or with a history of severe asthma were excluded from this study. Among children aged 24–59 months who received LAIV, the rate of medically significant wheezing, using a prespecified definition, was not greater compared with those who received TIV (*288*). Wheezing was observed more frequently among younger LAIV recipients aged 6–23 months in this study; LAIV is not licensed for this age group. In a previous randomized placebo-controlled safety

trial among children aged 12 months–17 years without a history of asthma by parental report, an elevated risk for asthma events (RR: 4.1; CI = 1.3–17.9) was documented among 728 children aged 18–35 months who received LAIV. Of the 16 children with asthma-related events in this study, seven had a history of asthma on the basis of subsequent medical record review. None required hospitalization, and elevated risks for asthma were not observed in other age groups (*286*).

Another study was conducted among >11,000 children aged 18 months–18 years in which 18,780 doses of vaccine were administered for 4 years. For children aged 18 months–4 years, no increase was reported in asthma visits 0–15 days after vaccination compared with the prevaccination period. A significant increase in asthma events was reported 15–42 days after vaccination, but only in vaccine year 1 (*289*). A 4-year, open-label field trial study assessed LAIV safety of more than 2000 doses administered to children aged 18 months–18 years with a history of intermittent wheeze who were otherwise healthy. Among these children, no increased risk was reported for medically attended acute respiratory illnesses, including acute asthma exacerbation, during the 0–14 or 0–42 days after LAIV compared with the pre- and postvaccination reference periods (*290*).

Initial data from VAERS during 2007–2008, following ACIP's recommendation for LAIV use in healthy children aged 2–4 years, did not suggest a concern for wheezing after LAIV in young children. However data also suggest uptake of LAIV was limited, and safety monitoring for wheezing events after LAIV is ongoing (CDC, unpublished data, 2008).

Adults Aged 19–49 Years

Among adults, runny nose or nasal congestion (28%–78%), headache (16%–44%), and sore throat (15%–27%) have been reported more often among vaccine recipients than placebo recipients (*277,291*). In one clinical trial among a subset of healthy adults aged 18–49 years, signs and symptoms reported significantly more often ($p<0.05$) among LAIV recipients (n = 2,548) than placebo recipients (n = 1,290) within 7 days after each dose included cough (14% and 11%, respectively), runny nose (45% and 27%, respectively), sore throat (28% and 17%, respectively), chills (9% and 6%, respectively), and tiredness/weakness (26% and 22%, respectively) (*92*). A review of 460 reports to VAERS after distribution of approximately 2.5 million doses during the 2003–04 and 2004–05 influenza seasons did not indicate any new safety concerns (*292*). Few of the LAIV VAERS reports (9%) were SAEs; respiratory events were the most common conditions reported.

Persons at Higher Risk for Influenza-Related Complications

Limited data assessing the safety of LAIV use for certain groups at higher risk for influenza-related complications are available. In one study of 54 HIV-infected persons aged 18–58 years and with CD4+ counts ≥200 cells/mm^3 who received LAIV, no SAEs were reported during a 1-month follow-up period (*266*). Similarly, one study demonstrated no significant difference in the frequency of adverse events or viral shedding among HIV-infected children aged 1–8 years on effective antiretroviral therapy who were administered LAIV compared with HIV-uninfected children receiving LAIV (*267*). LAIV was well-tolerated among adults aged ≥65 years with chronic medical conditions (*293*). These findings suggest that persons at risk for influenza complications who have inadvertent exposure to LAIV would not have significant adverse events or prolonged viral shedding and that persons who have contact with persons at higher risk for influenza-related complications may receive LAIV.

Comparisons of LAIV and TIV Efficacy or Effectiveness

Both TIV and LAIV have been demonstrated to be effective in children and adults. However, data directly comparing the efficacy or effectiveness of these two types of influenza vaccines are limited and insufficient to identify whether one vaccine might offer a clear advantage over the other in certain settings or populations. Studies comparing the efficacy of TIV to that of LAIV have been conducted in a variety of settings and populations using several different outcomes. One randomized, double-blind, placebo-controlled challenge study that was conducted among 92 healthy adults aged 18–41 years assessed the efficacy of both LAIV and TIV in preventing influenza infection when challenged with wild-type strains that were antigenically similar to vaccine strains (*294*). The overall efficacy in preventing laboratory-documented influenza from all three influenza strains combined was 85% and 71%, respectively, when challenged 28 days after vaccination by viruses to which study participants were susceptible before vaccination. The difference in efficacy between the two vaccines was not statistically significant in this limited study. No additional challenges were conducted to assess efficacy at time points later than 28 days (*294*). In a randomized, double-blind, placebo-controlled trial that was conducted among young adults during the 2004–05 influenza season, when the majority of circulating H3N2 viruses were antigenically drifted from that season's vaccine viruses, the efficacy of LAIV and TIV against culture-confirmed influenza was 57% and 77%, respectively. The difference in

efficacy was not statistically significant and was attributable primarily to a difference in efficacy against influenza B (*222*). A similar study conducted during the 2005–06 influenza season found no significant difference in vaccine efficacy (*221*).

A randomized controlled clinical trial conducted among children aged 6–59 months during the 2004–05 influenza season demonstrated a 55% reduction in cases of culture-confirmed influenza among children who received LAIV compared with those who received TIV (*288*). In this study, LAIV efficacy was higher compared with TIV against antigenically drifted viruses and well-matched viruses (*288*). An open-label, nonrandomized, community-based influenza vaccine trial conducted during an influenza season when circulating H3N2 strains were poorly matched with strains contained in the vaccine also indicated that LAIV, but not TIV, was effective against antigenically drifted H3N2 strains during that influenza season. In this study, children aged 5–18 years who received LAIV had significant protection against laboratory-confirmed influenza (37%) and pneumonia and influenza events (50%) (*295*). A recent observational study conducted among military personnel aged 17–49 years over three influenza seasons indicated that persons who received TIV had a significantly lower incidence of health-care encounters resulting in diagnostic coding for pneumonia and influenza compared with those who received LAIV. However, among new recruits being vaccinated for the first time, the incidence of pneumonia- and influenza-coded health-care encounters among those received LAIV was similar to those receiving TIV (*296*).

Although LAIV is not licensed for use in persons with risk factors for influenza complications, certain studies have compared the efficacy of LAIV to TIV in these groups. LAIV provided 32% increased protection in preventing culture-confirmed influenza compared with TIV in one study conducted among children aged ≥6 years and adolescents with asthma (*297*) and 52% increased protection compared with TIV among children aged 6–71 months with recurrent respiratory tract infections (*298*).

Effectiveness of Vaccination for Decreasing Transmission to Contacts

Decreasing transmission of influenza from caregivers and household contacts to persons at high risk might reduce ILI and complications among persons at high risk. Influenza virus infection and ILI are common among HCP (*299–301*). Influenza outbreaks have been attributed to low vaccination rates among HCP in hospitals and long-term–care facilities (*302–304*). One serosurvey demonstrated that 23% of HCP had serologic evidence of influenza virus infection during a single influenza season; the majority had mild illness or subclinical infection (*299*). Observational studies have demonstrated that vaccination of HCP is associated with decreased deaths among nursing home patients (*305,306*). In one cluster-randomized controlled trial that included 2,604 residents of 44 nursing homes, significant decreases in mortality, ILI, and medical visits for ILI care were demonstrated among residents in nursing homes in which staff were offered influenza vaccination (coverage rate: 48%) compared with nursing homes in which staff were not provided with vaccination (coverage rate: 6%) (*307*). A review concluded that vaccination of HCP in settings in which patients also were vaccinated provided significant reductions in deaths among elderly patients from all causes and deaths from pneumonia (*308*).

Epidemiologic studies of community outbreaks of influenza demonstrate that school-aged children typically have the highest influenza illness attack rates, suggesting routine universal vaccination of children might reduce transmission to their household contacts and possibly others in the community. Results from certain studies have indicated that the benefits of vaccinating children might extend to protection of their adult contacts and to persons at risk for influenza complications in the community. However, these data are limited, and studies have not used laboratory-confirmed influenza as an outcome measure. A single-blinded, randomized controlled study conducted as part of a 1996–1997 vaccine effectiveness study demonstrated that vaccinating preschool-aged children with TIV reduced influenza-related morbidity among some household contacts (*309*). A randomized, placebo-controlled trial among children with recurrent respiratory tract infections demonstrated that members of families with children who had received LAIV were significantly less likely to have respiratory tract infections and reported significantly fewer workdays lost compared with families with children who received placebo (*310*). In nonrandomized community-based studies, administration of LAIV has been demonstrated to reduce MAARI (*311,312*) and ILI-related economic and medical consequences (e.g., workdays lost and number of health-care provider visits) among contacts of vaccine recipients (*312*). Households with children attending schools in which school-based LAIV vaccination programs had been established reported less ILI and fewer physician visits during peak influenza season compared with households with children in schools in which no LAIV vaccination had been offered. However a decrease in the overall rate of school absenteeism was not reported in communities in which LAIV vaccination was offered (*312*). During an influenza outbreak during the 2005–06 influenza season, countywide school-based influenza vaccination was associated with reduced absenteeism among elementary and high school

students in one county that implemented a school based vaccination program compared with another county without such a program (*313*). These community-based studies have not used laboratory-confirmed influenza as an outcome.

Some studies also have documented reductions in influenza illness among persons living in communities where focused programs for vaccinating children have been conducted. A community-based observational study conducted during the 1968 pandemic using a univalent inactivated vaccine reported that a vaccination program targeting school-aged children (coverage rate: 86%) in one community reduced influenza rates within the community among all age groups compared with another community in which aggressive vaccination was not conducted among school-aged children (*314*). An observational study conducted in Russia demonstrated reductions in ILI among the community-dwelling elderly after implementation of a vaccination program using TIV for children aged 3–6 years (57% coverage achieved) and children and adolescents aged 7–17 years (72% coverage achieved) (*315*). In a nonrandomized community-based study conducted over three influenza seasons, 8%–18% reductions in the incidence of MAARI during the influenza season among adults aged ≥35 years were observed in communities in which LAIV was offered to all children aged ≥18 months (estimated coverage rate: 20%–25%) compared with communities that did not provide routine influenza vaccination programs for all children (*311*). In a subsequent influenza season, the same investigators documented a 9% reduction in MAARI rates during the influenza season among persons aged 35–44 years in intervention communities, where coverage was estimated at 31% among school children. However, MAARI rates among persons aged ≥45 years were lower in the intervention communities regardless of the presence of influenza in the community, suggesting that lower rates could not be attributed to vaccination of school children against influenza (*295*).

The largest study to examine the community effects of increasing overall vaccine coverage was an ecologic study that described the experience in Ontario, Canada, which was the only province to implement a universal influenza vaccination program beginning in 2000. On the basis of models developed from administrative and viral surveillance data, influenza-related mortality, hospitalizations, ED use, and physicians' office visits decreased significantly more in Ontario after program introduction than in other provinces, with the largest reductions observed in younger age groups (*316*).

Effectiveness of Influenza Vaccination When Circulating Influenza Virus Strains Differ from Vaccine Strains

Manufacturing trivalent influenza virus vaccines is a challenging process that takes 6–8 months to complete. Vaccination can provide reduced but substantial cross-protection against drifted strains in some seasons, including reductions in severe outcomes such as hospitalization. Usually one or more circulating viruses with antigenic changes compared with the vaccine strains are identified in each influenza season. In addition, two distinct lineages of influenza B viruses have co-circulated in recent years, and limited cross-protection is observed against the lineage not represented in the vaccine (*48*). However, assessment of the clinical effectiveness of influenza vaccines cannot be determined solely by laboratory evaluation of the degree of antigenic match between vaccine and circulating strains. In some influenza seasons, circulating influenza viruses with significant antigenic differences predominate, and reductions in vaccine effectiveness sometimes are observed compared with seasons when vaccine and circulating strains are well-matched,(*107,121,125,173,222*). However, even during years when vaccine strains were not antigenically well matched to circulating strains (the result of antigenic drift), substantial protection has been observed against severe outcomes, presumably because of vaccine-induced cross-reacting antibodies (*121,125,222,283*). For example, in one study conducted during the 2003–04 influenza season, when the predominant circulating strain was an influenza A (H3N2) virus that was antigenically different from that season's vaccine strain, effectiveness against laboratory-confirmed influenza illness among persons aged 50–64 years was 60% among healthy persons and 48% among persons with medical conditions that increased the risk for influenza complications (*125*). An interim, within-season analysis during the 2007–08 influenza season indicated that vaccine effectiveness was 44% overall, 54% among healthy persons aged 5–49 years, and 58% against influenza A, despite the finding that viruses circulating in the study area were predominately a drifted influenza A (H3N2) and an influenza B strain from a different lineage compared with vaccine strains (*317*). Among children, both TIV and LAIV provide protection against infection even in seasons when vaccines and circulating strains are not well-matched. Vaccine effectiveness against ILI was 49%–69% in two observational studies, and 49% against medically attended, laboratory-confirmed influenza in a case-control study conducted among young children during the 2003–04 influenza season, when a drifted influenza A (H3N2) strain predominated, based on viral surveillance data (*102,106*). However, continued improvements in collecting

representative circulating viruses and use of surveillance data to forecast antigenic drift are needed. Shortening manufacturing time to increase the time to identify good vaccine candidate strains from among the most recent circulating strains also is important. Data from multiple seasons that are collected in a consistent manner are needed to better understand vaccine effectiveness during seasons when circulating and vaccine virus strains are not well-matched.

Seasonal influenza vaccines are not expected to provide protection against novel influenza A (H1N1) virus infection because this novel strain hemagglutinin is substantially different from seasonal influenza A (H1N1). Preliminary immunologic data indicate that few persons have antibody that shows evidence of cross-reactivity against novel influenza A (H1N1) virus, and few show increases in antibody titer to novel influenza A (H1N1) virus after vaccination with the 2007–08 or the 2008–09 seasonal influenza vaccines (*318*). Vaccines currently are being developed that are specific to novel influenza A (H1N1) virus.

Cost-Effectiveness of Influenza Vaccination

Economic studies of influenza vaccination are difficult to compare because they have used different measures of both costs and benefits (e.g., cost-only, cost-effectiveness, cost-benefit, or cost-utility). However, most studies find that vaccination reduces or minimizes health care, societal, and individual costs and the productivity losses and absenteeism associated with influenza illness. One national study estimated the annual economic burden of seasonal influenza in the United States (using 2003 population and dollars) to be $87.1 billion, including $10.4 billion in direct medical costs (*319*).

Studies of influenza vaccination in the United States among persons aged ≥65 years have estimated substantial reductions in hospitalizations and deaths and overall societal cost savings (*168,169*). Studies comparing adults in different age groups also find that vaccination is economically beneficial. One study that compared the economic impact of vaccination among persons aged ≥65 years with those aged 15–64 years indicated that vaccination resulted in a net savings per quality-adjusted life year (QALY) and that the Medicare program saved costs of treating illness by paying for vaccination (*320*). A study of a larger population comparing persons aged 50–64 years with those aged ≥65 years estimated the cost-effectiveness of influenza vaccination to be $28,000 per QALY saved (in 2000 dollars) in persons aged 50–64 years compared with $980 per QALY saved among persons aged ≥65 years (*321*).

Economic analyses among adults aged <65 years have reported mixed results regarding influenza vaccination. Two studies in the United States found that vaccination can reduce both direct medical costs and indirect costs from work absenteeism and reduced productivity (*322,323*). However, another U.S. study indicated no productivity and absentee savings in a strategy to vaccinate healthy working adults, although vaccination was still estimated to be cost-effective (*324*).

Cost analyses have documented the considerable financial burden of illness among children. In a study of 727 children conducted at a medical center during 2000–2004, the mean total cost of hospitalization for influenza-related illness was $13,159 ($39,792 for patients admitted to an intensive care unit and $7,030 for patients cared for exclusively on the wards) (*325*). A strategy that focuses on vaccinating children with medical conditions that confer a higher risk for influenza complications are more cost-effective than a strategy of vaccinating all children (*324*). An analysis that compared the costs of vaccinating children of varying ages with TIV and LAIV indicated that costs per QALY saved increased with age for both vaccines. In 2003 dollars per QALY saved, costs for routine vaccination using TIV were $12,000 for healthy children aged 6–23 months and $119,000 for healthy adolescents aged 12–17 years compared with $9,000 and $109,000 using LAIV, respectively (*326*). Economic evaluations of vaccinating children have demonstrated a wide range of cost estimates, but have generally found this strategy to be either cost-saving or cost-beneficial (*327–330*).

Economic analyses are sensitive to the vaccination venue, with vaccination in medical care settings incurring higher projected costs. In a published model, the mean cost (year 2004 values) of vaccination was lower in mass vaccination ($17.04) and pharmacy ($11.57) settings than in scheduled doctor's office visits ($28.67) (*331*). Vaccination in nonmedical settings was projected to be cost saving for healthy adults aged ≥50 years and for high-risk adults of all ages. For healthy adults aged 18–49 years, preventing an episode of influenza would cost $90 if vaccination were delivered in a pharmacy setting, $210 in a mass vaccination setting, and $870 during a scheduled doctor's office visit (*331*). Medicare payment rates in recent years have been less than the costs associated with providing vaccination in a medical practice (*332*).

Vaccination Coverage Levels

Continued annual monitoring is needed to determine the effects on vaccination coverage of vaccine supply delays and shortages, changes in influenza vaccination recommendations and target groups for vaccination, reimbursement rates for vaccine and vaccine administration, and other factors related to vaccination coverage among adults and children. One of the *Healthy People 2010* objectives (objective no. 14-29a) includes

achieving an influenza vaccination coverage level of 90% for persons aged ≥65 years and among nursing home residents (*333,334*); new strategies to improve coverage are needed to achieve this objective (*335,336*). Increasing vaccination coverage among persons who have high-risk conditions and are aged <65 years, including children at high risk, is the highest priority for expanding influenza vaccine use.

On the basis of the 2007 final data and the 2008 early release data from the National Health Interview Survey (NHIS), estimated national influenza vaccine coverage during the 2006–07 and 2007–08 influenza seasons increased minimally among persons aged ≥65 years and those aged 50–64 years (Table 3) and are only slightly lower than coverage levels observed before the 2004–05 vaccine shortage year (*337–339*). In the 2006–07 and 2007–08 influenza seasons, estimated vaccination coverage levels among adults with high-risk conditions aged 18–49 years were 25% and 30%, respectively, substantially lower than the *Healthy People 2000* and *Healthy People 2010* objectives of 60% (Table 3) (*333,334*).

Studies conducted among children and adults indicate that opportunities to vaccinate persons at risk for influenza complications (e.g., during hospitalizations for other causes) often are missed. In one study, 23% of children hospitalized with influenza and a comorbidity had a previous hospitalization during the preceding influenza vaccination season (*340*). In a study of hospitalized Medicare patients, only 31.6% were vaccinated before admission, 1.9% during admission, and 10.6% after admission (*341*). A study in New York City conducted during 2001–2005 among 7,063 children aged 6–23 months indicated that 2-dose vaccine coverage increased from 1.6% to 23.7% over time; however, although the average number of medical visits during which an opportunity to be vaccinated decreased during the course of the study from 2.9 to 2.0 per child, 55% of all visits during the final year of the study still represented a missed vaccination opportunity (*342*). Using standing orders in hospitals increases vaccination rates among hospitalized persons (*343*), and vaccination of hospitalized patients is safe and stimulates an appropriate immune response (*158*). In one survey, the strongest predictor of receiving vaccination was the survey respondent's belief that he or she was in a high-risk group, based on data from one survey; however, many persons in high-risk groups did not know that they were in a group recommended for vaccination (*344*).

Reducing racial/ethnic health disparities, including disparities in influenza vaccination coverage, is an overarching national goal that is not being met (*334*). Estimated vaccination coverage levels in 2007 among persons aged ≥65 years were 70% for non-Hispanic whites, 58% for non-Hispanic blacks, and 54% for Hispanics (*345*). Among Medicare beneficiaries, other key factors that contribute to disparities in coverage include variations in the propensity of patients to actively seek vaccination and variations in the likelihood that providers recommend vaccination (*346,347*). One study estimated that eliminating these disparities in vaccination coverage would have an impact on mortality similar to the impact of eliminating deaths attributable to kidney disease among blacks or liver disease among Hispanics (*348*).

Reported vaccination levels are low among children at increased risk for influenza complications. Coverage among children aged 2–17 years with asthma for the 2004–05 influenza season was estimated to be 29% (*349*). One study reported 79% vaccination coverage among children attending a cystic fibrosis treatment center (*350*). During the first season for which ACIP recommended that all children aged 6 months–23 months receive vaccination, 33% received 1 or more doses of influenza vaccine, and 18% received 2 doses if they were unvaccinated previously (*351*). Among children enrolled in HMOs who had received a first dose during 2001–2004, second dose coverage varied from 29% to 44% among children aged 6–23 months and from 12% to 24% among children aged 2–8 years (*352*). A rapid analysis of influenza vaccination coverage levels among members of an HMO in Northern California demonstrated that during the 2004–05 influenza season, the first year of the recommendation for vaccination of children aged 6–23 months, 1-dose coverage was 57% (*353*). During the 2006–07 influenza season, the second season for which ACIP recommended that all children aged 6 months–23 months receive vaccination, coverage remained low and did not increase substantially from the 2004–05 season. Data collected in 2007 by the National Immunization Survey indicated that for the 2006–07 season, 32% of children aged 6–23 months received at least 1 dose of influenza vaccine and 21% were fully vaccinated (i.e., received 1 or 2 doses depending on previous vaccination history); however, results varied substantially among states (*354*). As has been reported for older adults, a physician recommendation for vaccination and the perception that having a child be vaccinated "is a smart idea" were associated positively with likelihood of vaccination of children aged 6–23 months (*355*). Similarly, children with asthma were more likely to be vaccinated if their parents recalled a physician recommendation to be vaccinated or believed that the vaccine worked well (*356*). Implementation of a reminder/recall system in a pediatric clinic increased the percentage of children with asthma receiving vaccination from 5% to 32% (*357*).

Although annual vaccination is recommended for HCP and is a high priority for reducing morbidity associated with influenza in health-care settings and for expanding influenza vaccine use (*358–360*), national survey data demonstrated a vaccination coverage level of only 42% among HCP during the 2005–06 season, and 44% during the 2006–07 season (Table

TABLE 3. Influenza vaccination* coverage levels for the 2005–06, 2006–07, and 2007-08 influenza seasons, by population group — National Health Interview Survey (NHIS), United States, 2006, 2007, and 2008, and National Immunization Survey (NIS), 2006 and 2007

	2005–06 season			2006–07 season			2007–08 season		
	Crude sample size†	Influenza vaccination level		Crude sample size	Influenza vaccination level		Crude sample size	Influenza vaccination level	
Population group		%	(CI§)		%	(CI)		%	(CI)
Persons with an age indication									
Aged 6–23 mos (NIS¶)	13,546	32.2	(30.9–33.5)	9,710	31.8	(30.2–33.4)		NA**	
Aged 2–4 yrs	611	26.4	(22.2–31.0)	636	39.2	(34.9–43.6)	674	40.3	(35.8–45.0)
Aged 50–64 yrs	2,843	31.6	(29.5–33.8)	2,787	37.1	(34.8–39.5)	3,258	38.4	(36.4–40.4)
Aged ≥65 yrs	2,328	64.5	(62.6–66.8)	2,260	66.0	(63.7–68.3)	2,658	66.3	(64.2–68.3)
Persons with high-risk conditions††									
Aged 5–17 yrs	376	22.1	(17.1–28.2)	283	28.0	(20.0–37.1)	262	36.2	(29.3–43.6)
Aged 18–49 yrs	937	23.4	(20.2–26.9)	883	25.3	(21.8–29.3)	1,049	30.4	(27.1–34.0)
Aged 50–64 yrs	878	44.3	(40.2–48.5)	824	47.8	(43.4–52.1)	1,001	48.4	(44.7–52.2)
Aged 18–64 yrs	1,815	33.4	(30.5–36.5)	2,303	35.8	(33.0–38.8)	2,050	38.8	(36.2–41.4)
Persons without high-risk conditions									
Aged 5–17 yrs	2,679	12.4	(10.9–14.1)	2,570	17.3	(15.4–19.2)	2,925	21.1	(19.3–23.1)
Aged 18–49 yrs	6,275	13.4	(12.4–14.6)	5.844	15.3	(14.2–16.6)	6,467	17.0	(15.7–18.3)
Aged 50–64 yrs	1,956	26.0	(23.7–28.4)	1,956	32.7	(30.3–35.2)	2,248	34.1	(31.7–36.6)
Pregnant women§§	126	12.3	(7.2–20.4)	123	14.7	(8.9–23.2)	113	24.2	(15.1–36.6)
Health-care workers¶¶	833	41.8	(37.4–46.3)	850	44.4	(40.2–48.7)		NA	
Household contacts of persons at high risk, including children aged <5 yrs* **									
Aged 5–17 yrs	840	16.3	(13.4–19.7)	741	26.0	(21.5–31.1)	968	24.8	(21.4–28.6)
Aged 18–49 yrs	1621	14.4	(12.5–16.5)	1,349	17.0	(15.0–19.4)	1,753	19.5	(17.1–22.1)

* Answered yes to this question, "During the past 12 months, have you had a flu shot (flu spray)," and answered the follow-up question "What was the month and year of your most recent shot (spray)." Questions were asked during a face-to-face interview conducted any day during March through August in the respective study year.

† The population sizes by subgroups is available at http://www.cdc.gov/flu/professionals/vaccination/pdf/influenza_vaccine_target_populations.pdf.

§ 95% confidence interval.

¶ NIS uses provider-verified vaccination status to improve the accuracy of the estimate. The NIS estimate for the 2007–08 season will be available fall 2009 The NHIS coverage estimates based on parental report were 39.5% (CI = 32.8–46.7, n = 295) for the 2005–06 season, 48.0% (CI = 40.2–55.9; n = 368) for the 2006–07 season, and 49.1% (CI = 41.9–56.4) for the 2007–08 season.

** Data not yet available.

†† Adults categorized as being at high risk for influenza-related complications self-reported one or more of the following: 1) ever being told by a physician they had diabetes, emphysema, coronary heart disease, angina, heart attack, or other heart condition; 2) having a diagnosis of cancer during the previous 12 months (excluding nonmelanoma skin cancer) or ever being told by a physician they have lymphoma, leukemia, or blood cancer during the previous 12 months (post coding for a cancer diagnosis was not yet completed at the time of this publication so this diagnosis was not include in the 2006–07 season data.); 3) being told by a physician they have chronic bronchitis or weak or failing kidneys; or 4) reporting an asthma episode or attack during the preceding 12 months. For children aged <18 years, high-risk conditions included ever having been told by a physician of having diabetes, cystic fibrosis, sickle cell anemia, congenital heart disease, other heart disease, or neuromuscular conditions (seizures, cerebral palsy, and muscular dystrophy), or having an asthma episode or attack during the preceding 12 months.

§§ Aged 18–44 years, pregnant at the time of the survey and without high-risk conditions.

¶¶ Adults were classified as health-care workers if they were employed in a health-care occupation or in a health-care–industry setting, on the basis of standard occupation and industry categories recoded in groups by CDC's National Center for Health Statistics.

*** Interviewed sample child or adult in each household containing at least one of the following: a child aged <5 years, an adult aged ≥65 years, or any person aged 5–17 years at high risk (see previous footnote ††). To obtain information on household composition and high-risk status of household members, the sampled adult, child, and person files from NHIS were merged. Interviewed adults who were health-care workers or who had high-risk conditions were excluded. Information could not be assessed regarding high-risk status of other adults aged 18–64 years in the household; therefore, certain adults aged 18–64 years who lived with an adult aged 18–64 years at high risk were not included in the analysis. Also note that although the recommendation for children aged 2–4 years was not in place during the 2005–06 season, children aged 2–4 years in these calculations were considered to have an indication for vaccination to facilitate comparison of coverage data for subsequent years.

3). Vaccination of HCP has been associated with reduced work absenteeism (*300*) and with fewer deaths among nursing home patients (*305,307*) and elderly hospitalized patients (*308*). Factors associated with a higher rate of influenza vaccination among HCP include older age, being a hospital employee, having employer-provided health-care insurance, having had pneumococcal or hepatitis B vaccination in the past, or having visited a health-care professional during the preceding year. Non-Hispanic black HCP were less likely than non-Hispanic white HCP to be vaccinated (*361*). HCP who decline vaccination frequently express doubts about the risk for influenza and the need for vaccination, are concerned about vaccine effectiveness and side effects, and dislike injections (*362*).

Vaccine coverage among pregnant women increased during the 2007–08 influenza season with 24% of pregnant women reporting vaccination, excluding pregnant women who reported diabetes, heart disease, lung disease, and other selected high-risk conditions (Table 3). However, the sample size is small, and the increase in coverage compared with previous seasons was not statistically significant. In a study of influenza vaccine acceptance by pregnant women, 71% of those who were offered the vaccine chose to be vaccinated (*363*). However, a 1999 survey of obstetricians and gynecologists determined that only 39% administered influenza vaccine to obstetric patients in their practices, although 86% agreed that pregnant women's risk for influenza-related morbidity and mortality increases during the last two trimesters (*364*).

Influenza vaccination coverage in all groups recommended for vaccination remains suboptimal. Despite the timing of the peak of influenza disease, administration of vaccine decreases substantially after November. According to results from the NHIS regarding the two most recent influenza seasons for which these data are available, approximately 84% of all influenza vaccination were administered during September–November. Among persons aged ≥65 years, the percentage of September–November vaccinations was 92% (*365*). Because many persons recommended for vaccination remain unvaccinated at the end of November, CDC encourages public health partners and health-care providers to conduct vaccination clinics and other activities that promote seasonal influenza vaccination annually during National Influenza Vaccination Week (December 6–12, 2009) and throughout the remainder of the influenza season.

Self-report of influenza vaccination among adults compared with determining vaccination status from the medical record, is a sensitive and specific source of information (*366,367*). Patient self-reports should be accepted as evidence of influenza vaccination in clinical practice (*367*). However, information on the validity of parents' reports of pediatric influenza vaccination is not yet available.

Recommendations for Using TIV and LAIV During the 2009–10 Influenza Season

Both TIV and LAIV prepared for the 2009–10 season will include A/Brisbane/59/2007 (H1N1)-like, A/Brisbane/10/2007 (H3N2)-like, and B/Brisbane/60/2008-like antigens. The influenza B virus component of the 2009–10 vaccine is from the Victoria lineage (*368*). These viruses will be used because they are representative of seasonal influenza viruses that are predicted to be circulating in the United States during the 2009–10 influenza season and have favorable growth properties in eggs. Seasonal influenza vaccines are not expected to provide substantial protection against infection with the recently identified novel influenza A (H1N1) (*318*), and guidance for the prevention of infection against this virus will be published separately.

TIV and LAIV can be used to reduce the risk for influenza virus infection and its complications. Vaccination providers should administer influenza vaccine to any person who wishes to reduce the likelihood of becoming ill with influenza or transmitting influenza to others should they become infected.

Healthy, nonpregnant persons aged 2–49 years can choose to receive either vaccine. Some TIV formulations are FDA-licensed for use in persons as young as age 6 months (see Recommended Vaccines for Different Age Groups). TIV is licensed for use in persons with high-risk conditions (Table 2). LAIV is FDA-licensed for use only for persons aged 2–49 years. In addition, FDA has indicated that the safety of LAIV has not been established in persons with underlying medical conditions that confer a higher risk for influenza complications. All children aged 6 months–8 years who have not been vaccinated previously at any time with at least 1 dose of either LAIV (if appropriate) or TIV should receive 2 doses of age-appropriate vaccine in the same season, with a single dose during subsequent seasons.

Target Groups for Protection Through Vaccination

Influenza vaccine should be provided to all persons who want to reduce the risk for becoming ill with influenza or of transmitting it to others. However, emphasis on providing routine vaccination annually to certain groups at higher risk for influenza infection or complications is advised, including all children aged 6 months–18 years, all persons aged ≥50 years, and other adults at risk for medical complications from influenza. In addition, all persons who live with or care for persons at high risk for influenza-related complications, including contacts of children aged <6 months, should receive influenza

vaccine annually (Boxes 1 and 2). Approximately 85% of the U.S. population is included in one or more of these target groups; however, <40% of the U.S. population received an influenza vaccination during the 2008–09 influenza season.

Children Aged 6 Months–18 Years

Beginning with the 2008–09 influenza season, annual vaccination for all children aged 6 months–18 years was recommended. Children and adolescents at high risk for influenza complications should continue to be a focus of vaccination efforts as providers and programs transition to routinely vaccinating all children.

Healthy children aged 2–18 years can receive either LAIV or TIV. Children aged 6–23 months, and those aged 2–4 years who have evidence of asthma wheezing or who have medical conditions that put them at higher risk for influenza complications should receive TIV (see Considerations When Using LAIV). All children aged 6 months–8 years who have not received vaccination against influenza previously should receive 2 doses of vaccine the first year they are vaccinated.

Persons at Risk for Medical Complications

Vaccination to prevent influenza is particularly important for the following persons, who are at increased risk for severe complications from influenza, or at higher risk for influenza-related outpatient, ED, or hospital visits:

- all children aged 6 months–4 years (59 months);
- all persons aged ≥50 years;
- children and adolescents (aged 6 months–18 years) who are receiving long-term aspirin therapy and who might be at risk for experiencing Reye syndrome after influenza virus infection;
- women who will be pregnant during the influenza season;
- adults and children who have chronic pulmonary (including asthma) or cardiovascular (except hypertension), renal, hepatic, neurological/neuromuscular, hematologic, or metabolic disorders (including diabetes mellitus);
- adults and children who have immunosuppression (including immunosuppression caused by medications or by HIV); and
- residents of nursing homes and other long-term–care facilities.

For children, the risk for severe complications from seasonal influenza is highest among those aged <2 years, who have much higher rates of hospitalization for influenza-related complications compared with older children (*7,32,39*). Medical care and ED visits attributable to influenza are increased among children aged <5 years compared with older children (*32*). Chronic neurologic and neuromuscular conditions include any condition (e.g., cognitive dysfunction, spinal cord injuries, seizure disorders, or other neuromuscular disorders) that can compromise respiratory function or the handling of respiratory secretions or that can increase the risk for aspiration (*30*).

Persons Who Live With or Care for Persons at High Risk for Influenza-Related Complications

To prevent transmission to persons identified above, vaccination with TIV or LAIV (unless contraindicated) also is recommended for the following persons. When vaccine supply is limited, vaccination efforts should focus on delivering vaccination to these persons:

- HCP;
- household contacts (including children) and caregivers of children aged ≤59 months (i.e., aged <5 years) and adults aged ≥50 years; and
- household contacts (including children) and caregivers of persons with medical conditions that put them at higher risk for severe complications from influenza.

Children Aged <6 Months

Children aged <6 months are not recommended for vaccination, and antivirals are not licensed for use among infants. Protection of young infants, who have hospitalization rates similar to those observed among the elderly, depends on vaccination of the infants' close contacts. A recent study conducted in Bangladesh demonstrated that infants born to vaccinated women have significant protection from laboratory-confirmed influenza, either through transfer of influenza-specific maternal antibodies or by reducing the risk for exposure to influenza that might occur through vaccination of the mother (*154*). All household contacts, health-care and day care providers, and other close contacts of young infants should be vaccinated.

Vaccination of Specific Populations

Children Aged 6 Months–18 Years

All children aged 6 months–18 years should be vaccinated against influenza annually. In 2004, ACIP recommended routine vaccination for all children aged 6–23 months, and in 2006, ACIP expanded the recommendation to include all children aged 24–59 months. Recommendations to provide routine influenza vaccination to all children and adolescents aged 6 months–18 years are made on the basis of 1) accumulated evidence that influenza vaccine is effective and safe for children (see Influenza Vaccine Efficacy, Effectiveness, and Safety); 2) increased evidence that influenza has substantial

adverse impacts among children and their contacts (e.g., school absenteeism, increased antibiotic use, medical care visits, and parental work loss) (see Health-Care Use, Hospitalizations, and Deaths Attributed to Influenza); and 3) an expectation that a simplified age-based influenza vaccine recommendation for all children and adolescents will improve vaccine coverage levels among children who already have a risk- or contact-based indication for annual influenza vaccination.

Children typically have the highest attack rates during community outbreaks of influenza and serve as a major source of transmission within communities (*1,2*). If sufficient vaccination coverage among children can be achieved, potential benefits include the indirect effect of reducing influenza among persons who have close contact with children and reducing overall transmission within communities. Achieving and sustaining community-level reductions in influenza will require mobilization of community resources and development of sustainable annual vaccination campaigns to assist health-care providers and vaccination programs in providing influenza vaccination services to children of all ages. In many areas, innovative community-based efforts, which might include mass vaccination programs in school or other community settings, will be needed to supplement vaccination services provided in health-care providers' offices or public health clinics. In nonrandomized community-based controlled trials, reductions in ILI-related symptoms and medical visits among household contacts have been demonstrated in communities where vaccination programs among school-aged children were established compared with communities without such vaccination programs (*295,314,315*).Reducing influenza-related illness among children who are at high risk for influenza complications should continue to be a primary focus of influenza-prevention efforts. Children who should be vaccinated because they are at high risk for influenza complications include all children aged 6–59 months, children with certain medical conditions, children who are contacts of children aged <5 years (60 months) or of persons aged ≥50 years, and children who are contacts of persons at high risk for influenza complications because of medical conditions.

All children aged 6 months–8 years who have not received vaccination against influenza previously should receive 2 doses of vaccine the first influenza season that they are vaccinated. The second dose should be administered 4 or more weeks after the initial dose. When only 1 dose is administered to children aged 6 months–8 years during their first year of vaccination, 2 doses should be administered in the following season. However, 2 doses should only be administered in the first season of vaccination, or in the season that immediately follows if only 1 dose is administered in the first season. For example, children aged 6 months–8 years who were vaccinated for the first time with the 2008–09 influenza vaccine but received only 1 dose should receive 2 doses of the 2009–10 influenza vaccine. All other children aged 6 months–8 years who have previously received 1 or more doses of influenza vaccine at any time should receive 1 dose of the 2009–10 influenza vaccine. Children aged 6 months–8 years who received only a single vaccination during a season before 2007–08 should receive 1 dose of the 2009–10 influenza vaccine. If possible, both doses should be administered before onset of influenza season. However, vaccination, including the second dose, is recommended even after influenza virus begins to circulate in a community.

HCP and Other Persons Who Can Transmit Influenza to Those at High Risk

Healthy persons who are infected with influenza virus, including those with subclinical infection, can transmit influenza virus to persons at higher risk for complications from influenza. In addition to HCP, groups that can transmit influenza to high-risk persons and that should be vaccinated include

- employees of assisted living and other residences for persons in groups at high risk;
- persons who provide home care to persons in groups at high risk; and
- household contacts of persons in groups at high risk, including contacts such as children or mothers of newborns.

In addition, because children aged <5 years are at increased risk for influenza-related hospitalization (*7,31,39,369,370*) compared with older children, vaccination is recommended for their household contacts and out-of-home caregivers. Because influenza vaccines have not been licensed by FDA for use among children aged <6 months, emphasis should be placed on vaccinating contacts of these children.

Healthy HCP and persons aged 2–49 years who are contacts of persons in these groups and who are not contacts of severely immunosuppressed persons (see Close Contacts of Immunocompromised Persons) should receive either LAIV or TIV when indicated or requested. All other persons, including pregnant women, should receive TIV.

All HCP and persons in training for health-care professions should be vaccinated annually against influenza. Persons working in health-care settings who should be vaccinated include physicians, nurses, and other workers in both hospital and outpatient-care settings, medical emergency-response workers (e.g., paramedics and emergency medical technicians), employees of nursing home and long-term–care facilities who have

contact with patients or residents, and students in these professions who will have contact with patients (*359,360,371*).

Facilities that employ HCP should provide vaccine to workers by using approaches that have been demonstrated to be effective in increasing vaccination coverage. Health-care administrators should consider the level of vaccination coverage among HCP to be one measure of a patient safety quality program and consider obtaining signed declinations from personnel who decline influenza vaccination for reasons other than medical contraindications (*360,372,373*). Influenza vaccination rates among HCP within facilities should be regularly measured and reported, and ward-, unit-, and specialty-specific coverage rates should be provided to staff and administration (*360)*. Studies have demonstrated that organized campaigns can attain higher rates of vaccination among HCP with moderate effort and by using strategies that increase vaccine acceptance (*358,360,374*).

Efforts to increase vaccination coverage among HCP are supported by various national accrediting and professional organizations and in certain states by statute. The Joint Commission on Accreditation of Health-Care Organizations has approved an infection-control standard that requires accredited organizations to offer influenza vaccinations to staff, including volunteers and licensed independent practitioners with close patient contact. The standard became an accreditation requirement beginning January 1, 2007 (*375*). In addition, the Infectious Diseases Society of America has recommended mandatory vaccination for HCP, with a provision for declination of vaccination based on religious or medical reasons (*376*). Some states have regulations regarding vaccination of HCP in long-term–care facilities (*377*), require that health-care facilities offer influenza vaccination to HCP, or require that HCP either receive influenza vaccination or indicate a religious, medical, or philosophic reason for not being vaccinated (*378,379*).

Close Contacts of Immunocompromised Persons

Immunocompromised persons are at risk for influenza complications but might have inadequate protection after vaccination. Close contacts of immunocompromised persons, including HCP, should be vaccinated to reduce the risk for influenza transmission. TIV is recommended for vaccinating household members, HCP, and others who have close contact with severely immunosuppressed persons (e.g., patients with hematopoietic stem cell transplants) during those periods in which the immunosuppressed person requires care in a protective environment (typically defined as a specialized patient-care area with a positive airflow relative to the corridor, high-efficiency particulate air filtration, and frequent air changes) (*360,380*).

LAIV transmission from a recently vaccinated person causing clinically important illness in an immunocompromised contact has not been reported. The rationale for avoiding use of LAIV among HCP or other close contacts of severely immunocompromised patients is the theoretical risk that a live, attenuated vaccine virus could be transmitted to the severely immunosuppressed person. As a precautionary measure, HCP who receive LAIV should avoid providing care for severely immunosuppressed patients requiring a protected environment for 7 days after vaccination. Hospital visitors who have received LAIV should avoid contact with severely immunosuppressed persons in protected environments for 7 days after vaccination but should not be restricted from visiting less severely immunosuppressed patients.

No preference is indicated for TIV use by persons who have close contact with persons with lesser degrees of immunosuppression (e.g., persons with diabetes, persons with asthma who take corticosteroids, persons who have recently received chemotherapy or radiation but who are not being cared for in a protective environment as defined above, or persons infected with HIV) or for TIV use by HCP or other healthy nonpregnant persons aged 2–49 years in close contact with persons in all other groups at high risk.

Pregnant Women

Pregnant women and newborns are at risk for influenza complications, and all women who are pregnant or will be pregnant during influenza season should be vaccinated. The American College of Obstetricians and Gynecologists and the American Academy of Family Physicians also have recommended routine vaccination of all pregnant women (*381*). No preference is indicated for use of TIV that does not contain thimerosal as a preservative (see Vaccine Preservative [Thimerosal] in Multidose Vials of TIV) for any group recommended for vaccination, including pregnant women. LAIV is not licensed for use in pregnant women. However, pregnant women do not need to avoid contact with persons recently vaccinated with LAIV.

Breastfeeding Mothers

Vaccination is recommended for all persons, including breastfeeding women, who are contacts of infants or children aged <5 years because infants and young children are at high risk for influenza complications and are more likely to require medical care or hospitalization if infected. Breastfeeding does not affect the immune response adversely and is not a con-

traindication for vaccination (*179*). Unless contraindicated because of other medical conditions, women who are breastfeeding can receive either TIV or LAIV. In one randomized controlled trial conducted in Bangladesh, infants born to women vaccinated during pregnancy had a lower risk for laboratory-confirmed influenza. However, the contribution to protection from influenza of breastfeeding compared with passive transfer of maternal antibodies during pregnancy was not determined (*154*).

Travelers

The risk for exposure to influenza during travel depends on the time of year and destination. In the temperate regions of the Southern Hemisphere, influenza activity occurs typically during April–September. In temperate climate zones of the Northern and Southern Hemispheres, travelers also can be exposed to influenza during the summer, especially when traveling as part of large tourist groups (e.g., on cruise ships) that include persons from areas of the world in which influenza viruses are circulating (*382,383*). In the tropics, influenza occurs throughout the year. In a study among Swiss travelers to tropical and subtropical countries, influenza was the most frequently acquired vaccine-preventable disease (*384*).

Any traveler who wants to reduce the risk for influenza infection should consider influenza vaccination, preferably at least 2 weeks before departure. In particular, persons at high risk for complications of influenza and who were not vaccinated with influenza vaccine during the preceding fall or winter should consider receiving influenza vaccine before travel if they plan to travel

- to the tropics,
- with organized tourist groups at any time of year, or
- to the Southern Hemisphere during April–September.

No information is available about the benefits of revaccinating persons before summer travel who already were vaccinated during the preceding fall, and revaccination is not recommended. Persons at high risk who receive the previous season's vaccine before travel should be revaccinated with the current vaccine the following fall or winter. Persons at higher risk for influenza complications should consult with their health-care practitioner to discuss the risk for influenza or other travel-related diseases before embarking on travel during the summer.

General Population

Vaccination is recommended for any persons who wish to reduce the likelihood of their becoming ill with influenza or transmitting influenza to others should they become infected. Healthy, nonpregnant persons aged 2–49 years might choose to receive either TIV or LAIV. All other persons aged ≥6 months should receive TIV. Persons who provide essential community services should be considered for vaccination to minimize disruption of essential activities during influenza outbreaks. Students or other persons in institutional settings (e.g., those who reside in dormitories or correctional facilities) should be encouraged to receive vaccine to minimize morbidity and the disruption of routine activities during influenza epidemics (*385,386*).

Recommended Vaccines for Different Age Groups

When vaccinating children aged 6–35 months with TIV, health-care providers should use TIV that has been licensed by the FDA for this age group (i.e., TIV manufactured by Sanofi Pasteur [FluZone]) (*219*). TIV from Novartis (Fluvirin) is FDA-approved in the United States for use among persons aged ≥4 years (*220*). TIV from GlaxoSmithKline (Fluarix and FluLaval) or CSL Biotherapies (Afluria) is labeled for use in persons aged ≥18 years because data to demonstrate immunogenicity or efficacy among younger persons have not been provided to FDA (*207,208,218*). LAIV from MedImmune (FluMist) is recommended for use by healthy nonpregnant persons aged 2–49 years (Table 2) (*291*). If a pediatric vaccine dose (0.25mL) is administered to an adult, an additional pediatric dose (0.25 mL) should be given to provide a full adult dose (0.5mL). If the error is discovered later (after the patient has left the vaccination setting), an adult dose should be administered as soon as the patient can return. No action needs to be taken if an adult dose is administered to a child. Several new vaccine formulations are being evaluated in immunogenicity and efficacy trials; when licensed, these new products will increase the influenza vaccine supply and provide additional vaccine choices for practitioners and their patients.

Influenza Vaccines and Use of Influenza Antiviral Medications

Unvaccinated persons who are receiving antiviral medications for treatment or chemoprophylaxis often also are recommended for vaccination. Administration of TIV to persons receiving influenza antivirals is acceptable. The effect on safety and effectiveness of LAIV coadministration with influenza antiviral medications has not been studied. However, because influenza antivirals reduce replication of influenza viruses, LAIV should not be administered until 48 hours after cessation of influenza antiviral therapy, and influenza antiviral medications should not be administered for 2 weeks after receipt of LAIV. Persons receiving antivirals within the period 2 days before to 14 days

after vaccination with LAIV should be revaccinated at a later date with any approved vaccine formulation (*179,291*).

Considerations When Using LAIV

LAIV is an option for vaccination of healthy, nonpregnant persons aged 2–49 years, including HCP and other close contacts of high-risk persons (excepting severely immunocompromised persons who require care in a protected environment). No preference is indicated for LAIV or TIV when considering vaccination of healthy,¶ nonpregnant persons aged 2–49 years. Possible advantages of LAIV include its potential to induce a broad mucosal and systemic immune response in children, its ease of administration, and the possibly increased acceptability of an intranasal rather than intramuscular route of administration.

If the vaccine recipient sneezes after administration, the dose should not be repeated. However, if nasal congestion is present that might impede delivery of the vaccine to the nasopharyngeal mucosa, deferral of administration should be considered until resolution of the illness, or TIV should be administered instead. No data exist about concomitant use of nasal corticosteroids or other intranasal medications (*261*).

Although FDA licensure of LAIV excludes children aged 2–4 years with a history of asthma or recurrent wheezing, the precise risk, if any, of wheezing caused by LAIV among these children is unknown because experience with LAIV among these young children is limited. Young children might not have a history of recurrent wheezing if their exposure to respiratory viruses has been limited because of their age. Certain children might have a history of wheezing with respiratory illnesses but have not had asthma diagnosed.

The following screening recommendations should be used to assist persons who administer influenza vaccines in providing the appropriate vaccine for children aged 2–4 years.

- Clinicians and vaccination programs should screen for asthma or wheezing illness (or history of wheezing illness) when considering use of LAIV for children aged 2–4 years, and should avoid use of this vaccine in children with asthma or a recent wheezing episode within the previous 12 months. Health-care providers should consult the medical record, when available, to identify children aged 2–4 years with asthma or recurrent wheezing that might indicate asthma. In addition, to identify children who might be at greater risk for asthma and possibly at increased risk for wheezing after receiving LAIV, parents or caregivers of children aged 2–4 years should be asked: "In the past 12 months, has a health-care provider ever told you that your child had wheezing or asthma?" Children whose parents or caregivers answer "yes" to this question and children who have asthma or who had a wheezing episode noted in the medical record during the preceding 12 months should not receive LAIV. TIV is available for use in children with asthma or wheezing (387).LAIV can be administered to persons with minor acute illnesses (e.g., diarrhea or mild upper respiratory tract infection with or without fever). However, if nasal congestion is present that might impede delivery of the vaccine to the nasopharyngeal mucosa, deferral of administration should be considered until resolution of the illness.

Contraindications and Precautions for Use of LAIV

The effectiveness or safety of LAIV is not known for the following groups and administration of LAIV is contraindicated:

- persons with a history of hypersensitivity, including anaphylaxis, to any of the components of LAIV or to eggs.
- persons aged <2 years or those aged ≥50 years;
- adults and children who have chronic pulmonary (including asthma), cardiovascular (except hypertension), renal, hepatic, neurological/neuromuscular, hematological, or metabolic disorders (including diabetes mellitus);
- adults and children who have immunosuppression (including immunosuppression caused by medications or by HIV);
- children aged 2–4 years whose parents or caregivers report that a health-care provider has told them during the preceding 12 months that their child had wheezing or asthma, or whose medical record indicates a wheezing episode has occurred during the preceding 12 months;
- children or adolescents aged 6 months–18 years receiving aspirin or other salicylates (because of the association of Reye syndrome with wild-type influenza virus infection); or
- pregnant women.

A moderate or severe illness with or without fever is a precaution for use of LAIV. GBS within 6 weeks following a previous dose of influenza vaccine is considered to be a precaution for use of influenza vaccines. LAIV should not be administered to close contacts of immunosuppressed persons who require a protected environment.

¶ Use of the term "healthy" in this recommendation refers to persons who do not have any of the underlying medical conditions that confer high risk for severe complications (see Contraindications and Precautions for Use of LAIV).

Personnel Who Can Administer LAIV

Low-level introduction of vaccine viruses into the environment probably is unavoidable when administering LAIV. The risk for acquiring vaccine viruses from the environment is unknown but is probably low. Severely immunosuppressed persons should not administer LAIV. However, other persons at higher risk for influenza complications can administer LAIV. These include persons with underlying medical conditions placing them at higher risk or who are likely to be at risk, including pregnant women, persons with asthma, and persons aged ≥50 years.

Concurrent Administration of Influenza Vaccine with Other Vaccines

Use of LAIV concurrently with measles, mumps, rubella (MMR) alone and MMR and varicella vaccine among children aged 12–15 months has been studied, and no interference with the immunogenicity to antigens in any of the vaccines was observed (*261,388*). Among adults aged ≥50 years, the safety and immunogenicity of zoster vaccine and TIV was similar whether administered simultaneously or spaced 4 weeks apart (*389*). In the absence of specific data indicating interference, following ACIP's general recommendations for vaccination is prudent (*179*). Inactivated vaccines do not interfere with the immune response to other inactivated vaccines or to live vaccines. Inactivated or live vaccines can be administered simultaneously with LAIV. However, after administration of a live vaccine, at least 4 weeks should pass before another live vaccine is administered.

Recommendations for Vaccination Administration and Vaccination Programs

Although influenza vaccination levels increased substantially during the 1990s, little progress has been made since 2000 toward achieving national health objectives, and further improvements in vaccine coverage levels are needed to reduce the annual impact of influenza substantially. Strategies to improve vaccination levels, including using reminder/recall systems and standing orders programs (*335,336,345*), should be implemented whenever feasible. Vaccination efforts should begin as soon as vaccine is available and continue through the influenza season. Vaccination coverage can be increased by administering vaccine before and during the influenza season to persons during hospitalizations or routine health-care visits. Vaccinations can be provided in alternative settings (e.g., pharmacies, grocery stores, workplaces, or other locations in the community), thereby making special visits to physicians' offices or clinics unnecessary. Coordinated campaigns such as the National Influenza Vaccination Week (December 6–12, 2009) provide opportunities to refocus public attention on the benefits, safety, and availability of influenza vaccination throughout the influenza season. When educating patients about adverse events, clinicians should provide access to Vaccine Information Sheets (available at http://www.cdc.gov/vaccines/pubs/vis), and emphasize that 1) TIV contains noninfectious killed viruses and cannot cause influenza, 2) LAIV contains weakened influenza viruses that cannot replicate outside the upper respiratory tract and are unlikely to infect others, and 3) concomitant symptoms or respiratory disease unrelated to vaccination with either TIV or LAIV can occur after vaccination. Adverse events after influenza vaccination should be reported promptly to VAERS at http://vaers.hhs.gov even if the health-care professional is not certain that the vaccine caused the event.

Information About the Vaccines for Children Program

The Vaccines for Children (VFC) program supplies vaccine to all states, territories, and the District of Columbia for use by participating providers. These vaccines are to be provided to eligible children without vaccine cost to the patient or the provider, although the provider might charge a vaccine administration fee. All routine childhood vaccines recommended by ACIP are available through this program, including influenza vaccines. The program saves parents and providers out-of-pocket expenses for vaccine purchases and provides cost savings to states through CDC's vaccine contracts. The program results in lower vaccine prices and ensures that all states pay the same contract prices. Detailed information about the VFC program is available at http://www.cdc.gov/vaccines/programs/vfc/default.htm.

Influenza Vaccine Supply Considerations

The annual supply of influenza vaccine and the timing of its distribution cannot be guaranteed in any year. During the 2008–09 influenza season, 113 million doses of influenza vaccine were distributed in the United States. For the 2009–10 season, total production of seasonal influenza vaccine for the United States is anticipated to be >130 million doses, depending on demand and production yields. However, influenza vaccine distribution delays or vaccine shortages remain possible. One factor that affects production is the inherent critical time constraints in manufacturing the vaccine given

the annual updating of the influenza vaccine strains. Multiple manufacturing and regulatory issues, including the anticipated need to produce a separate vaccine against novel influenza A (H1N1), also might affect the production schedule. To ensure optimal use of available doses of influenza vaccine, health-care providers, persons planning organized campaigns, and state and local public health agencies should develop plans for expanding outreach and infrastructure to vaccinate more persons in targeted groups and others who wish to reduce their risk for influenza. They also should develop contingency plans for the timing and prioritization of administering influenza vaccine if the supply of vaccine is delayed or reduced.

If supplies of TIV are not adequate, vaccination should be carried out in accordance with local circumstances of supply and demand based on the judgment of state and local health officials and health-care providers. Guidance for tiered use of TIV during prolonged distribution delays or supply shortfalls is available at http://www.cdc.gov/flu/professionals/vaccination/vax_priority.htm and will be modified as needed in the event of shortage. CDC and other public health agencies will assess the vaccine supply on a continuing basis throughout the manufacturing period and will inform both providers and the general public if any indication exists of a substantial delay or an inadequate supply.

Because LAIV is recommended for use only in healthy nonpregnant persons aged 2–49 years, no recommendations for prioritization of LAIV use are made. Either LAIV or TIV can be used when considering vaccination of healthy, nonpregnant persons aged 2–49 years. However, during shortages of TIV, LAIV should be used preferentially when feasible for all healthy nonpregnant persons aged 2–49 years (including HCP) who desire or are recommended for vaccination to increase the availability of inactivated vaccine for persons at high risk.

Timing of Vaccination

Vaccination efforts should be structured to ensure the vaccination of as many persons as possible over the course of several months, with emphasis on vaccinating before influenza activity in the community begins. Even if vaccine distribution begins before October, distribution probably will not be completed until December or January. The following recommendations reflect this phased distribution of vaccine.

In any given year, the optimal time to vaccinate patients cannot be determined precisely because influenza seasons vary in their timing and duration, and more than one outbreak might occur in a single community in a single year. In the United States, localized outbreaks that indicate the start of seasonal influenza activity can occur as early as October. However, in >80% of influenza seasons since 1976, peak influenza activity (which often is close to the midpoint of influenza activity for the season) has not occurred until January or later, and in >60% of seasons, the peak was in February or later (Figure 1). In general, health-care providers should begin offering vaccination soon after vaccine becomes available and if possible by October. To avoid missed opportunities for vaccination, providers should offer vaccination during routine health-care visits or during hospitalizations whenever vaccine is available. The potential for addition of a novel influenza A (H1N1) vaccine program to the current burden on vaccination programs and providers underscores the need for careful planning of seasonal vaccination programs. Beginning use of seasonal vaccine as soon as available, including in September or earlier, might reduce the overlap of seasonal and novel influenza vaccination efforts.

Vaccination efforts should continue throughout the season, because the duration of the influenza season varies, and influenza might not appear in certain communities until February or March. Providers should offer influenza vaccine routinely, and organized vaccination campaigns should continue throughout the influenza season, including after influenza activity has begun in the community. Vaccine administered in December or later, even if influenza activity has already begun, is likely to be beneficial in the majority of influenza seasons. The majority of adults have antibody protection against influenza virus infection within 2 weeks after vaccination (*390,391*).

All children aged 6 months–8 years who have not received vaccination against influenza previously should receive their first dose as soon after vaccine becomes available as is feasible and should receive the second dose ≥4 weeks later. This practice increases the opportunity for both doses to be administered before or shortly after the onset of influenza activity.

Vaccination clinics should be scheduled through December, and later if feasible, with attention to settings that serve children aged ≥6 months, pregnant women, other persons aged <50 years at increased risk for influenza-related complications, persons aged ≥50 years, HCP, and persons who are household contacts of children aged ≤59 months or other persons at high risk. Planners are encouraged to develop the capacity and flexibility to schedule at least one vaccination clinic in December. Guidelines for planning large-scale vaccination clinics are available at http://www.cdc.gov/flu/professionals/vaccination/vax_clinic.htm.

During a vaccine shortage or delay, substantial proportions of TIV doses might not be released and distributed until November and December or later. When the vaccine is substantially delayed or disease activity has not subsided, providers should consider offering vaccination clinics into January and beyond as long as vaccine supplies are available. Campaigns using LAIV also can extend into January and beyond.

Strategies for Implementing Vaccination Recommendations in Health-Care Settings

Successful vaccination programs combine publicity and education for HCP and other potential vaccine recipients, a plan for identifying persons recommended for vaccination, use of reminder/recall systems, assessment of practice-level vaccination rates with feedback to staff, and efforts to remove administrative and financial barriers that prevent persons from receiving the vaccine, including use of standing orders programs (*336,392*). The use of standing orders programs by long-term–care facilities (e.g., nursing homes and skilled nursing facilities), hospitals, and home health agencies ensures that vaccination is offered. Standing orders programs for influenza vaccination should be conducted under the supervision of a licensed practitioner according to a physician-approved facility or agency policy by HCP trained to screen patients for contraindications to vaccination, administer vaccine, and monitor for adverse events. The Centers for Medicare and Medicaid Services (CMS) has removed the physician signature requirement for the administration of influenza and pneumococcal vaccines to Medicare and Medicaid patients in hospitals, long-term–care facilities, and home health agencies (*393*). To the extent allowed by local and state law, these facilities and agencies can implement standing orders for influenza and pneumococcal vaccination of Medicare- and Medicaid-eligible patients. Payment for influenza vaccine under Medicare Part B is available (*394,395*) Other settings (e.g., outpatient facilities, managed care organizations, assisted living facilities, correctional facilities, pharmacies, and adult workplaces) are encouraged to introduce standing orders programs (*396*). In addition, physician reminders (e.g., flagging charts) and patient reminders are recognized strategies for increasing rates of influenza vaccination. Persons for whom influenza vaccine is recommended can be identified and vaccinated in the settings described in the following sections.

Outpatient Facilities Providing Ongoing Care

Staff in facilities providing ongoing medical care (e.g., physicians' offices, public health clinics, employee health clinics, hemodialysis centers, hospital specialty-care clinics, and outpatient rehabilitation programs) should identify and label the medical records of patients who should receive vaccination. Vaccine should be offered during visits throughout the influenza season. The offer of vaccination and its receipt or refusal should be documented in the medical record or vaccination information system. Patients for whom vaccination is recommended and who do not have regularly scheduled visits during the fall should be reminded by mail, telephone, or other means of the need for vaccination.

Outpatient Facilities Providing Episodic or Acute Care

Acute health-care facilities (e.g., EDs and walk-in clinics) should offer vaccinations throughout the influenza season to persons for whom vaccination is recommended or provide written information regarding why, where, and how to obtain the vaccine. This written information should be available in languages appropriate for the populations served by the facility.

Nursing Homes and Other Long-Term–Care Facilities

Vaccination should be provided routinely to all residents of long-term–care facilities. If possible, all residents should be vaccinated at one time before influenza season. In the majority of seasons, TIV will become available to long-term–care facilities in October or November, and vaccination should commence as soon as vaccine is available. As soon as possible after admission to the facility, the benefits and risks of vaccination should be discussed and education materials provided (*397*). Signed consent is not required (*398*). Residents admitted after completion of the vaccination program at the facility should be vaccinated at the time of admission.

Since October 2005, CMS has required nursing homes participating in the Medicare and Medicaid programs to offer all residents influenza and pneumococcal vaccines and to document the results. According to the requirements, each resident is to be vaccinated unless contraindicated medically, the resident or a legal representative refuses vaccination, or the vaccine is not available because of shortage. This information is to be reported as part of the CMS Minimum Data Set, which tracks nursing home health parameters (*395,399*).

Acute-Care Hospitals

Hospitals should serve as a key setting for identifying persons at increased risk for influenza complications. Unvaccinated persons of all ages (including children) with high-risk conditions and persons aged 6 months–18 years or ≥50 years who are hospitalized at any time during the period when vaccine is available should be offered and strongly encouraged to receive influenza vaccine before they are discharged. Standing orders to offer influenza vaccination to all hospitalized persons should be considered.

Visiting Nurses and Others Providing Home Care to Persons at High Risk

Nursing-care plans should identify patients for whom vaccination is recommended, and vaccine should be administered in the home if necessary as soon as influenza vaccine is available and throughout the influenza season. Caregivers and other persons in the household (including children) should be referred for vaccination.

Other Facilities Providing Services to Persons Aged ≥50 Years

Facilities providing services to persons aged ≥50 years (e.g., assisted living housing, retirement communities, and recreation centers) should offer unvaccinated residents, attendees, and staff annual on-site vaccination before the start of the influenza season. Continuing to offer vaccination throughout the fall and winter months is appropriate. Efforts to vaccinate newly admitted patients or new employees also should be continued, both to prevent illness and to avoid having these persons serve as a source of new influenza infections. Staff education should emphasize the benefits for self, staff and patients of protection from influenza through vaccination.

Health-Care Personnel

Health-care facilities should offer influenza vaccinations to all HCP, including night, weekend, and temporary staff. Particular emphasis should be placed on providing vaccinations to workers who provide direct care for persons at high risk for influenza complications. Efforts should be made to educate HCP regarding the benefits of vaccination and the potential health consequences of influenza illness for their patients, themselves, and their family members. All HCP should be provided convenient access to influenza vaccine at the work site, free of charge, as part of employee health programs (*360,374,375*).

Future Directions for Research and Recommendations Related to Influenza Vaccine

Although available influenza vaccines are effective and safe, additional research is needed to improve prevention efforts. Most mortality from influenza occurs among persons aged ≥65 years (*6*), and more immunogenic influenza vaccines are needed for this age group and other groups at high risk for mortality. Additional research also is needed to understand potential biases in estimating the benefits of vaccination among older adults in reducing hospitalizations and deaths (*82,175,400*). Additional studies of the relative cost-effectiveness and cost utility of influenza vaccination among children and adults, especially those aged <65 years, are needed and should be designed to account for year-to-year variations in influenza attack rates, illness severity, hospitalization costs and rates, and vaccine effectiveness when evaluating the long-term costs and benefits of annual vaccination (*401*). Additional data on indirect effects of vaccination also are needed to quantify the benefits of influenza vaccination of HCP in protecting their patients (*308*) and the benefits of vaccinating children to reduce influenza complications among those at risk. Because expansions in ACIP recommendations for vaccination will lead to more persons being vaccinated, much larger research networks are needed that can identify and assess the causality of very rare events that occur after vaccination, including GBS. Ongoing studies of safety in pediatric populations with expanded recommendations are needed and are underway. These research networks also could provide a platform for effectiveness and safety studies in the event of a pandemic. A recent study showed that influenza vaccines contain structures that can induce anti-GM1 antibodies after inoculation into mice (*402*). Further research on potential biologic or genetic risk factors for GBS in humans also is needed (*397*). In addition, a better understanding is needed of how to motivate persons at risk to seek annual influenza vaccination.

ACIP continues to review new vaccination strategies to protect against influenza, including the possibility of expanding routine influenza vaccination recommendations toward universal vaccination or other approaches that will help reduce or prevent the transmission of influenza and reduce the burden of severe disease (*403–408*). The 2009 ACIP expansion of annual vaccination recommendations to include all children aged 6 months–18 years will require a substantial increase in resources for epidemiologic research to develop long-term studies capable of assessing the possible effects on community-level transmission. Additional planning to improve surveillance systems capable of monitoring effectiveness, safety and vaccine coverage, and further development of implementation strategies will also be necessary. In addition, as noted by the National Vaccine Advisory Committee, strengthening the U.S. influenza vaccination system will require improving vaccine financing and demand and implementing systems to help better understand the burden of influenza in the United States (*409*). Vaccination programs capable of delivering annual influenza vaccination to a broad range of the population could potentially serve as a resilient and sustainable platform for delivering vaccines and monitoring outcomes for other urgently required public health interventions (e.g., vaccines for pandemic influenza or medications to prevent or treat illnesses caused by acts of terrorism).

Seasonal Influenza Vaccine and Influenza Viruses of Animal Origin

Human infection with novel or nonhuman influenza A virus strains, including influenza A viruses of animal origin, is a nationally notifiable disease (*410*). Human infections with nonhuman or novel human influenza A virus should be identified quickly and investigated to determine possible sources of exposure, identify additional cases, and evaluate the possibility of human-to-human transmission because transmission patterns could change over time with variations in these influenza A viruses.

Sporadic severe and fatal human cases of infection with highly pathogenic avian influenza A (H5N1) virus have been identified in Asia, Africa, Europe, and the Middle East, primarily among persons who have had direct or close unprotected contact with sick or dead birds associated with the ongoing H5N1 panzootic among birds (*411–419*). Limited, nonsustained human-to-human transmission of H5N1 virus has likely occurred in some case clusters (*420,421*). To date, no evidence exists of genetic reassortment between human influenza A and H5N1 viruses. However, influenza viruses derived from strains circulating among poultry (e.g., the H5N1 virus that has caused outbreaks of avian influenza and occasionally have infected humans) have the potential to recombine with human influenza A viruses (*422,423*). To date, highly pathogenic H5N1 virus has not been identified in wild or domestic birds or in humans in the United States. Guidance for testing suspected cases of H5N1 virus infection among persons in the U.S. and follow-up of contacts is available (*424,425*).

Human illness from infection with different avian influenza A subtype viruses also have been documented, including infections with low pathogenic and highly pathogenic viruses. A range of clinical illness has been reported for human infection with low pathogenic avian influenza viruses, including conjunctivitis with influenza A (H7N7) virus in the United Kingdom, lower respiratory tract disease and conjunctivitis with influenza A (H7N2) virus in the United Kingdom, and uncomplicated ILI with influenza A (H9N2) virus in Hong Kong and China (*426–432*). Two human cases of infection with low pathogenic influenza A (H7N2) were reported in the United States (*429*). Although human infections with highly pathogenic A (H7N7) virus infections typically have ILI or conjunctivitis, severe infections, including one fatal case in the Netherlands, have been reported (*433,434*). Conjunctivitis also has been reported because of human infection with highly pathogenic influenza A (H7N3) virus in Canada and low pathogenic A (H7N3) in the United Kingdom (*426,434*). In contrast, sporadic infections with highly pathogenic avian influenza A (H5N1) virus have caused severe illness in many countries, with an overall case-fatality proportion of >60% (*421,435*).

Swine influenza A (H1N1), A (H1N2), and A (H3N2) viruses, including reassortant viruses, are endemic among pig populations in the United States (*436*). Two clusters of influenza A (H2N3) virus infections among pigs have been reported recently (*437*). Outbreaks among pigs normally occur in colder weather months (late fall and winter) and sometimes with the introduction of new pigs into susceptible herds. An estimated 30% of the pig population in the United States has serologic evidence of having had swine influenza A (H1N1) virus infection. Sporadic human infections with a variety of swine influenza A viruses occur in the United States, but the incidence of these human infections is unknown (*438–443*). Persons infected with swine influenza A viruses typically report direct contact with ill pigs or places where pigs have been present (e.g., agricultural fairs or farms), and have symptoms that are clinically indistinguishable from infection with other respiratory viruses (*440,441,444,445*). Clinicians should consider swine influenza A virus infection in the differential diagnosis of patients with ILI who have had recent contact with pigs. The sporadic cases identified in recent years have not resulted in sustained human-to-human transmission of swine influenza A viruses or community outbreaks (*368,445*). Although immunity to swine influenza A viruses appears to be low (<2%) in the overall human population, 10%–20% of persons exposed occupationally to pigs (e.g., pig farmers or pig veterinarians) have been documented in certain studies to have antibody evidence of prior swine influenza A (H1N1) virus infection (*438,446*).

In April 2009, a novel influenza A (H1N1) virus similar to influenza viruses previously identified in swine was determined to the cause of an influenza-like respiratory illness among humans that spread across North America and throughout most of the world by May 2009 (*9,447*). The epidemiology of influenza caused by this novel influenza virus is still being studied, and whether this virus will achieve long-term circulation among humans or even replace one of the other seasonal influenza viruses as the cause of annual epidemics is unknown.

Current seasonal influenza vaccines are not expected to provide protection against human infection with avian influenza A viruses, including influenza A (H5N1) viruses, or to provide protection against currently circulating swine influenza A or the novel influenza A (H1N1) viruses (*318,448*). However, reducing seasonal influenza risk through influenza vaccination of persons who might be exposed to nonhuman influenza viruses (e.g., H5N1 virus) might reduce the theoretical risk for recombination of influenza A viruses of animal origin and human influenza A viruses by preventing seasonal influenza A virus infection within a human host.

CDC has recommended that persons who are charged with responding to avian influenza outbreaks among poultry receive seasonal influenza vaccination (*448,449*). As part of preparedness activities, the Occupational Safety and Health Administration (OSHA) has issued an advisory notice regarding poultry worker safety that is intended for implementation in the event of a suspected or confirmed avian influenza outbreak at a poultry facility in the United States. OSHA guidelines recommend that poultry workers in an involved facility receive vaccination against seasonal influenza; OSHA also has recommended that HCP involved in the care of patients with documented or suspected avian influenza should be vaccinated with the most recent seasonal human influenza vaccine to reduce the risk for co-infection with human influenza A viruses (*449*).

Recommendations for Using Antiviral Agents for Seasonal Influenza

Annual vaccination is the primary strategy for preventing complications of influenza virus infections. Antiviral medications with activity against influenza viruses are useful adjuncts in the prevention of influenza, and effective when used early in the course of illness for treatment. Four influenza antiviral agents are licensed in the United States: amantadine, rimantadine, zanamivir, and oseltamivir.

During the 2007–08 influenza season, influenza A (H1N1) viruses with a mutation that confers resistance to oseltamivir became more common in the United States and other countries (*450–452*). As of July 2009, in the United States, approximately 99% of human influenza A (H1N1) viruses tested, and none of the influenza A (H3N2) or influenza B viruses tested have been resistant to oseltamivir. As of July 2, 2009, with few exceptions, novel influenza A (H1N1) viruses that began circulating in April 2009 remained sensitive to oseltamivir (*453*). Oseltamivir resistance among circulating seasonal influenza A (H1N1) virus strains presents challenges for the selection of antiviral medications for treatment and chemoprophylaxis of influenza, and provides additional reasons for clinicians to test patients for influenza virus infection and to consult surveillance data when evaluating persons with acute respiratory illnesses during influenza season. CDC has published interim guidelines to provide options for treatment or chemoprophylaxis of influenza in the United States if oseltamivir-resistant seasonal influenza A (H1N1) viruses are circulating widely in a community or if the prevalence of oseltamivir-resistant influenza A (H1N1) viruses is uncertain (*8*). Updated guidance on antiviral use will be available from ACIP before the start of the 2009–10 influenza season. This guidance will include a summary of antiviral resistance data from the 2008–09 influenza season, and will be published separately from the vaccination recommendations. Until the ACIP recommendations for use of antivirals against influenza are published, CDC's previously published recommendations for use of influenza antiviral medications should be consulted for guidance on antiviral use (*8*). New guidance on clinical management of influenza, including use of antivirals, also is available from the Infectious Diseases Society of America (*454*).

Sources of Information Regarding Influenza and its Surveillance

Information regarding influenza surveillance, prevention, detection, and control is available at http://www.cdc.gov/flu. During October–May, surveillance information is updated weekly. In addition, periodic updates regarding influenza are published in *MMWR* (http://www.cdc.gov/mmwr). Additional information regarding influenza vaccine can be obtained by calling 1-800-CDC-INFO (1-800-232-4636). State and local health departments should be consulted about availability of influenza vaccine, access to vaccination programs, information related to state or local influenza activity, reporting of influenza outbreaks and influenza-related pediatric deaths, and advice concerning outbreak control.

Vaccine Adverse Event Reporting System (VAERS)

Adverse events after influenza vaccination should be reported promptly to VAERS at http://vaers.hhs.gov, even if the reporter is unsure whether vaccine caused the event. Clinically significant adverse events that follow vaccination should be reported to VAERS at http://www.vaers.hhs.gov. Reports may be filed securely online or by telephone at 1-800-822-7967 to request reporting forms or other assistance.

National Vaccine Injury Compensation Program

The National Vaccine Injury Compensation Program (VICP), established by the National Childhood Vaccine Injury Act of 1986, as amended, provides a mechanism through which compensation can be paid on behalf of a person determined to have been injured or to have died as a result of receiving a vaccine covered by VICP. The Vaccine Injury Table lists the vaccines covered by VICP and the injuries and conditions

(including death) for which compensation might be paid. If the injury or condition is not on the Table, or does not occur within the specified time period on the Table, persons must prove that the vaccine caused the injury or condition.

For a person to be eligible for compensation, the general filing deadlines for injuries require claims to be filed within 3 years after the first symptom of the vaccine injury; for a death, claims must be filed within 2 years of the vaccine-related death and not more than 4 years after the start of the first symptom of the vaccine-related injury from which the death occurred. When a new vaccine is covered by VICP or when a new injury/condition is added to the Table, claims that do not meet the general filing deadlines must be filed within 2 years from the date the vaccine or injury/condition is added to the Table for injuries or deaths that occurred up to 8 years before the Table change. Persons of all ages who receive a VICP-covered vaccine might be eligible to file a claim. Both the intranasal (LAIV) and injectable (TIV) trivalent influenza vaccines are covered under VICP. Additional information about VICP is available at http//www.hrsa.gov/vaccinecompensation or by calling 1-800-338-2382.

Additional Information Regarding Influenza Virus Infection Control Among Specific Populations

Each year, ACIP provides general, annually updated information regarding control and prevention of influenza. Other reports related to controlling and preventing influenza among specific populations (e.g., immunocompromised persons, HCP, hospital patients, pregnant women, children, and travelers) also are available in the following publications:

- CDC. General recommendations on immunization: recommendations of the Advisory Committee on Immunization Practices (ACIP) and the American Academy of Family Physicians (AAFP). MMWR 2006;55(No. RR-15).
- CDC. Influenza vaccination of health-care personnel: recommendations of the Healthcare Infection Control Practices Advisory Committee (HICPAC) and the Advisory Committee on Immunization Practices (ACIP). MMWR 2006;55(No. RR-2).
- CDC. Recommended immunization schedules for persons aged 0–18 years—United States, 2009. MMWR 2009;57:Q1–4.
- CDC. Recommended adult immunization schedule—United States, 2009. MMWR 2009;57:Q1–4.
- CDC. Guidelines for preventing health-care–associated pneumonia, 2003: recommendations of CDC and the Healthcare Infection Control Practices Advisory Committee. MMWR 2003;53(No. RR-3).
- CDC. Respiratory hygiene/cough etiquette in health-care settings. Atlanta, GA: US Department of Health and Human Services, CDC; 2003. Available at http://www.cdc.gov/flu/professionals/infectioncontrol/resphygiene.htm.
- CDC. Prevention and control of vaccine-preventable diseases in long-term–care facilities. Atlanta, GA: US Department of Health and Human Services, CDC; 2006. Available at http://www.cdc.gov/flu/professionals/infection control/longtermcare.htm.
- CDC. Vaccine safety. Atlanta, GA: US Department of Health and Human Services, CDC; 2009. Available at http://www.cdc.gov/vaccinesafety/index.htm.
- American College of Obstetricians and Gynecologists. Influenza vaccination and treatment during pregnancy. ACOG committee opinion no. 305. Obstet Gynecol 2004;104:1125–6.
- American Academy of Pediatrics. 2009 red book: report of the Committee on Infectious Diseases. 29th ed. Elk Grove Village, IL: American Academy of Pediatrics; 2009.
- Bodnar UR, Maloney SA, Fielding KL, et al. Preliminary guidelines for the prevention and control of ILI among passengers and crew members on cruise ships. Atlanta, GA: US Department of Health and Human Services, CDC; 1999. Available at http://wwwn.cdc.gov/travel/files/pre-guidelines-flu-cruiseships1999.ashx.
- CDC. Infection control guidance for the prevention and control of influenza in acute-care facilities. Atlanta, GA: US Department of Health and Human Services, CDC; 2007. Available at http://www.cdc.gov/flu/professionals/infectioncontrol/health-carefacilities.htm.
- Food and Drug Administration. FDA pandemic influenza preparedness strategic plan. Washington, DC: Food and Drug Administration; 2007. Available at http://www.fda.gov/oc/op/pandemic/strategicplan03_07.html.
- World Health Organization. Recommendations for influenza vaccines. Geneva, Switzerland: World Health Organization; 2007. Available at http://www.who.int/csr/disease/influenza/vaccinerecommendations/en/index.html.
- American Heart Association and American College of Cardiology. Influenza vaccination as secondary prevention for cardiovascular disease. Circulation 2006;114:1549–53. Available at http://circ.ahajournals.org/cgi/content/full/114/14/1549.

Acknowledgments

Assistance in the preparation of this report was provided by Carolyn Bridges, MD, Larisa Gubareva, MD, PhD, Lyn Finelli, DrPH, Amanda Zongrone, Influenza Division; Margaret Coleman, PhD, Gary L. Euler, DrPH, Peng-jun Lu, PhD, Jeanne Santoli, MD, Abigail Shefer, MD, Immunization Services Division; Penina Haber, PhD, Barbara Slade, MD, Immunization Safety Office, National Center for Preparedness, Detection and Control of Infectious Diseases, CDC. Neal Halsey, MD, The Johns Hopkins School of Public Health, and David Hrncir, MD, Southwest Allergy & Asthma Center, San Antonio, Texas, contributed to the hypersensitivity section of this document.

References

1. Monto AS, Kioumehr F. The Tecumseh Study of Respiratory Illness. IX. Occurrence of influenza in the community, 1966–1971. Am J Epidemiol 1975;102:553–63.
2. Glezen WP, Couch RB. Interpandemic influenza in the Houston area, 1974–76. N Engl J Med 1978;298:587–92.
3. Glezen WP, Greenberg SB, Atmar RL, et al. Impact of respiratory virus infections on persons with chronic underlying conditions. JAMA 2000;283:499–505.
4. Barker WH. Excess pneumonia and influenza associated hospitalization during influenza epidemics in the United States, 1970–78. Am J Public Health 1986;76:761–5.
5. Barker WH, Mullooly JP. Impact of epidemic type A influenza in a defined adult population. Am J Epidemiol 1980;112:798–811.
6. Thompson WW, Shay DK, Weintraub E, et al. Mortality associated with influenza and respiratory syncytial virus in the United States. JAMA 2003;289:179–86.
7. Thompson WW, Shay DK, Weintraub E, et al. Influenza-associated hospitalizations in the United States. JAMA 2004;292:1333–40.
8. CDC. CDC issues interim recommendations for the use of influenza antiviral medications in the setting of oseltamivir resistance among circulating influenza A (H1N1) viruses, 2008–09 influenza season. Atlanta, GA: US Department of Health and Human Services, CDC; 2008. Available at http://www2a.cdc.gov/HAN/ArchiveSys/ViewMsgV.asp?AlertNum=00279.
9. Dawood FS, Jain S, Finelli L, et al. Emergence of a novel swine-origin influenza A (H1N1) virus in humans. N Engl J Med 2009;360:2605–15.
10. Nichol KL, Treanor JJ. Vaccines for seasonal and pandemic influenza. J Infect Dis 2006;194(Suppl 2):S111–8.
11. Smith NM, Shay DK. Influenza vaccination for elderly people and their care workers. Lancet 2006;368:1752–3.
12. Ellenberg SS, Foulkes MA, Midthun K, et al. Evaluating the safety of new vaccines: summary of a workshop. Am J Public Health 2005;95:800–7.
13. Institute of Medicine. Vaccine safety research, data access, and public trust. Washington, DC: National Academies Press; 2005.
14. Bartlett DL, Ezzati-Rice TM, Stokley S, et al. Comparison of NIS and NHIS/NIPRCS vaccination coverage estimates. National Immunization Survey. National Health Interview Survey/National Immunization Provider Record Check Study. Am J Prev Med 2001;20:25–7.
15. Cox NJ, Subbarao K. Influenza. Lancet 1999;354:1277–82.
16. Garten RJ, Davis CT, Russell CA, et al. **Antigenic and genetic characteristics of swine-origin 2009 A (H1N1) influenza viruses circulating in humans. Science 2009. Available at http://www.sciencemag.org/cgi/content/abstract/1176225.
17. Nelson MI, Viboud C, Simonsen L, et al. Multiple reassortment events in the evolutionary history of H1N1 influenza A virus since 1918. PLoS Pathog 2008;4:e1000012.
18. Russell CA, Jones TC, Barr IG, et al. The global circulation of seasonal influenza A (H3N2) viruses. Science 2008;320:340–6.
19. Xu X, Lindstrom SE, Shaw MW, et al. Reassortment and evolution of current human influenza A and B viruses. Virus Res 2004;103:55–60.
20. Clements ML, Betts RF, Tierney EL, et al. Serum and nasal wash antibodies associated with resistance to experimental challenge with influenza A wild-type virus. J Clin Microbiol 1986;24:157–60.
21. Couch RB. Kasel JA. Immunity to influenza in man. Annu Rev Microbiol 1983;37:529–49.
22. Cooney MK, Fox JP, Hall CE. The Seattle Virus Watch. VI. Observations of infections with and illness due to parainfluenza, mumps and respiratory syncytial viruses and *Mycoplasma pneumoniae*. Am J Epidemiol 1975;101:532–51.
23. Glezen WP, Taber LH, Frank AL, et al. Risk of primary infection and reinfection with respiratory syncytial virus. Am J Dis Child 1986;140:543–6.
24. Glezen WP. Morbidity associated with the major respiratory viruses. Pediatr Ann 1990;19:535–40.
25. CDC. Update: novel influenza A (H1N1) virus infections—worldwide, May 6, 2009. MMWR 2009;58:453–8.
26. CDC. Update: influenza activity—United States, September 28, 2008–April 4, 2009, and composition of the 2009–10 influenza vaccine. MMWR 2009;58:369–74.
27. Simonsen L, Clarke MJ, Williamson GD, et al. The impact of influenza epidemics on mortality: introducing a severity index. Am J Public Health 1997;87:1944–50.
28. Mullooly JP, Bridges CB, Thompson WW, et al. Influenza- and RSV-associated hospitalizations among adults. Vaccine 2007;25:846–55.
29. O'Brien MA, Uyeki TM, Shay DK, et al. Incidence of outpatient visits and hospitalizations related to influenza in infants and young children. Pediatrics 2004;113:585–93.
30. Keren R, Zaoutis TE, Bridges CB, et al. Neurological and neuromuscular disease as a risk factor for respiratory failure in children hospitalized with influenza infection. JAMA 2005;294:2188–94.
31. Neuzil KM, Wright PF, Mitchel EF Jr, et al. The burden of influenza illness in children with asthma and other chronic medical conditions. J Pediatr 2000;137:856–64.
32. Poehling KA, Edwards KM, Weinberg GA, et al. The underrecognized burden of influenza in young children. N Engl J Med 2006;355:31–40.
33. Olson DR, Heffernan RT, Paladini M, et al. Monitoring the impact of influenza by age: emergency department fever and respiratory complaint surveillance in New York City. PLoS Medicine 2007;4:e247.
34. Neuzil KM, Zhu Y, Griffin MR, et al. Burden of interpandemic influenza in children younger than 5 years: a 25-year prospective study. J Infect Dis 2002;185:147–52.
35. Neuzil KM, Mellen BG, Wright PF, et al. The effect of influenza on hospitalizations, outpatient visits, and courses of antibiotics in children. N Engl J Med 2000;342:225–31.

36. Bourgeois FT, Valim C, Wei JC, et al. Influenza and other respiratory virus-related emergency department visits among young children. Pediatrics 2006;118:e1–8.
37. Simonsen L, Fukuda K, Schonberger LB, et al. The impact of influenza epidemics on hospitalizations. J Infect Dis 2000;181:831–7.
38. Glezen WP, Decker M, Perrotta DM. Survey of underlying conditions of persons hospitalized with acute respiratory disease during influenza epidemics in Houston, 1978–1981. Am Rev Respir Dis 1987;136:550–5.
39. Izurieta HS, Thompson WW, Kramarz P, et al. Influenza and the rates of hospitalization for respiratory disease among infants and young children. N Engl J Med 2000;342:232–9.
40. Mullooly JP, Barker WH. Impact of type A influenza on children: a retrospective study. Am J Public Health 1982;72:1008–16.
41. Ampofo K, Gesteland PH, Bender J, et al. Epidemiology, complications, and cost of hospitalization in children with laboratory-confirmed influenza infection. Pediatrics 2006;118:2409–17.
42. Coffin SE, Zaoutis TE, Rosenquist AB, et al. Incidence, complications, and risk factors for prolonged stay in children hospitalized with community-acquired influenza. Pediatrics 2007;119:740–8.
43. Iwane MK, Edwards KM, Szilagyi PG, et al. Population-based surveillance for hospitalizations associated with respiratory syncytial virus, influenza virus, and parainfluenza viruses among young children. Pediatrics 2004;113:1758–64.
44. Schrag SJ, Shay DK, Gershman K, et al. Multistate surveillance for laboratory-confirmed, influenza-associated hospitalizations in children: 2003–2004. Pediatr Infect Dis J 2006;25:395–400.
45. Miller EK, Griffin MR, Edwards KM, et al. Influenza burden for children with asthma. Pediatrics 2008;121:1–8.
46. Bhat N, Wright JG, Broder KR, et al. Influenza-associated deaths among children in the United States, 2003–2004. N Engl J Med 2005;353:2559–67.
47. Louie JK, Schechter R, Honarmand S, et al. Severe pediatric influenza in California, 2003–2005: implications for immunization recommendations. Pediatrics 2006;117:e610–8.
48. CDC. Influenza activity—United States and worldwide, 2007–08 season. MMWR 2008;57:692–7.
49. Finelli L, Fiore A, Dhara R, et al. Influenza-associated pediatric mortality in the United States: increase of *Staphylococcus aureus* coinfection. Pediatrics 2008;122:805–11.
50. Creech CB 2nd, Kernodle DS, Alsentzer A, et al. Increasing rates of nasal carriage of methicillin-resistant *Staphylococcus aureus* in healthy children. Pediatr Infect Dis J 2005;24:617–21.
51. CDC. Severe methicillin-resistant *Staphylococcus aureus* community-acquired pneumonia associated with influenza—Louisiana and Georgia, December 2006–January 2007. MMWR 2007;56:325–9.
52. Couch RB. Influenza, influenza virus vaccine, and human immunodeficiency virus infection. Clin Infect Dis 1999;28:548–51.
53. Fine AD, Bridges CB, De Guzman AM, et al. Influenza A among patients with human immunodeficiency virus: an outbreak of infection at a residential facility in New York City. Clin Infect Dis 2001;32:1784–91.
54. Radwan HM, Cheeseman SH, Lai KK, et al. Influenza in human immunodeficiency virus-infected patients during the 1997–1998 influenza season. Clin Infect Dis 2000;31:604–6.
55. Safrin S, Rush JD, Mills J. Influenza in patients with human immunodeficiency virus infection. Chest 1990;98:33–7.
56. Tasker SA, O'Brien WA, Treanor JJ, et al. Effects of influenza vaccination in HIV-infected adults: a double-blind, placebo-controlled trial. Vaccine 1998;16:1039–42.
57. Neuzil KM, Reed GW, Mitchel EF Jr, et al. Influenza-associated morbidity and mortality in young and middle-aged women. JAMA 1999;281:901–7.
58. Lin JC, Nichol KL. Excess mortality due to pneumonia or influenza during influenza seasons among persons with acquired immunodeficiency syndrome. Arch Intern Med 2001;161:441–6.
59. Harris J. Influenza occurring in pregnant women: a statistical study of thirteen hundred and fifty cases. JAMA 1919;72:978–80.
60. Freeman DW, Barno A. Deaths from Asian influenza associated with pregnancy. Am J Obstet Gynecol 1959;78:1172–5.
61. Naleway AL, Smith WJ, Mullooly JP. Delivering influenza vaccine to pregnant women. Epidemiol Rev 2006;28:47–53.
62. Widelock D, Csizmas L, Klein S. Influenza, pregnancy, and fetal outcome. Public Health Rep 1963;78:1–11.
63. Louria DB, Blumenfeld HL, Ellis JT, et al. Studies on influenza in the pandemic of 1957–1958. II. Pulmonary complications of influenza. J Clin Invest 1959;38:213–65.
64. Irving WL, James DK, Stephenson T, et al. Influenza virus infection in the second and third trimesters of pregnancy: a clinical and seroepidemiological study. BJOG 2000;107:1282–9.
65. Kirshon B, Faro S, Zurawin RK, et al. Favorable outcome after treatment with amantadine and ribavirin in a pregnancy complicated by influenza pneumonia. A case report. J Reprod Med 1988;33:399–401.
66. Neuzil KM, Reed GW, Mitchel EF, et al. Impact of influenza on acute cardiopulmonary hospitalizations in pregnant women. Am J Epidemiol 1998;148:1094–102.
67. Schoenbaum SC, Weinstein L. Respiratory infection in pregnancy. Clin Obstet Gynecol 1979;22:293–300.
68. Shahab S, Glezen W. Influenza virus. In: Gonik B, ed. Viral diseases in pregnancy. New York, NY: Springer-Verlag; 194:215–23.
69. Kort BA, Cefalo RC, Baker VV. Fatal influenza A pneumonia in pregnancy. Am J Perinatol 1986;3:179–82.
70. Mullooly JP, Barker WH, Nolan TF Jr. Risk of acute respiratory disease among pregnant women during influenza A epidemics. Public Health Rep 1986;101:205–11.
71. Cox S, Posner SF, McPheeters M, et al. Hospitalizations with respiratory illness among pregnant women during influenza season. Obstet Gynecol 2006;107:1315–22.
72. Dodds L, McNeil SA, Fell DB, et al. Impact of influenza exposure on rates of hospital admissions and physician visits because of respiratory illness among pregnant women. CMAJ 2007;176:463–8.
73. Hartert TV, Neuzil KM, Shintani AK, et al. Maternal morbidity and perinatal outcomes among pregnant women with respiratory hospitalizations during influenza season. Am J Obstet Gynecol 2003;189:1705–12.
74. Griffiths PD, Ronalds CJ, Heath RB. A prospective study of influenza infections during pregnancy. J Epidemiol Community Health 1980;34:124–8.
75. McGeer A, Green KA, Plevneshi A, et al. Antiviral therapy and outcomes of influenza requiring hospitalization in Ontario, Canada. Clin Infect Dis 2007;45:1568–75.
76. Grayson ML, Melvani S, Druce J, et al. Efficacy of soap and water and alcohol-based hand-rub preparations against live H1N1 influenza virus on the hands of human volunteers. Clin Infect Dis 2009;48:285–91.

77. Jefferson T, Foxlee R, Del Mar C, et al. **Interventions for the interruption or reduction of the spread of respiratory viruses.** Cochrane Database Syst Rev 2007:CD006207.
78. Luby SP, Agboatwalla M, Feikin DR, et al. Effect of handwashing on child health: a randomised controlled trial. Lancet 2005;366:225–33.
79. Inglesby TV, Nuzzo JB, O'Toole T, et al. Disease mitigation measures in the control of pandemic influenza. Biosecur Bioterror 2006;4:366–75.
80. Bell DM. Non-pharmaceutical interventions for pandemic influenza, national and community measures. Emerg Infect Dis 2006;12:88–94.
81. Nichol KL. Heterogeneity of influenza case definitions and implications for interpreting and comparing study results. Vaccine 2006;24:6726–8.
82. Jackson LA, Jackson ML, Nelson JC, et al. Evidence of bias in estimates of influenza vaccine effectiveness in seniors. Int J Epidemiol 2006;35:337–44.
83. Simonsen L, Taylor RJ, Viboud C, et al. Mortality benefits of influenza vaccination in elderly people: an ongoing controversy. Lancet Infect Dis 2007;7:658–66.
84. WHO. Recommended composition of influenza virus vaccines for use in the 2009–2010 influenza season (northern hemisphere winter). Wkly Epidemiol Rec 2009;84:65–72.
85. Kilbourne E. Influenza. New York, NY: Plenum Medical Book Company; 1987.
86. Oxford JS, Schild GC, Potter CW, et al. **The specificity of the anti-haemagglutinin antibody response induced in man by inactivated influenza vaccines and by natural infection.** J Hyg (Lond) 1979;82:51–61.
87. Neuzil KM, Dupont WD, Wright PF, et al. Efficacy of inactivated and cold-adapted vaccines against influenza A infection, 1985 to 1990: the pediatric experience. Pediatr Infect Dis J 2001;20:733–40.
88. Potter CW, Oxford JS. Determinants of immunity to influenza infection in man. Br Med Bull 1979;35:69–75.
89. Hirota Y, Kaji M, Ide S, et al. Antibody efficacy as a keen index to evaluate influenza vaccine effectiveness. Vaccine 1997;15:962–7.
90. La Montagne JR, Noble GR, Quinnan GV, et al. Summary of clinical trials of inactivated influenza vaccine—1978. Rev Infect Dis 1983;5:723–36.
91. Treanor JWright PF. Immune correlates of protection against influenza in the human challenge model. Dev Biol (Basel) 2003;115:97–104.
92. Belshe RB, Nichol KL, Black SB, et al. **Safety, efficacy, and effectiveness of live, attenuated, cold-adapted influenza vaccine in an indicated population aged 5–49 years.** Clin Infect Dis 2004;39:920–7.
93. Daubeney P, Taylor CJ, McGaw J, et al. Immunogenicity and tolerability of a trivalent influenza subunit vaccine (Influvac) in high-risk children aged 6 months to 4 years. Br J Clin Pract 1997;51:87–90.
94. Gonzalez M, Pirez MC, Ward E, et al. Safety and immunogenicity of a paediatric presentation of an influenza vaccine. Arch Dis Child 2000;83:488–91.
95. Negri E, Colombo C, Giordano L, et al. Influenza vaccine in healthy children: a meta-analysis. Vaccine 2005;23:2851–61.
96. Wright PF, Cherry JD, Foy HM, et al. Antigenicity and reactogenicity of influenza A/USSR/77 virus vaccine in children—a multicentered evaluation of dosage and safety. Rev Infect Dis 1983;5:758–64.
97. Wright PF, Thompson J, Vaughn WK, et al. Trials of influenza A/New Jersey/76 virus vaccine in normal children: an overview of age-related antigenicity and reactogenicity. J Infect Dis 1977;136(Suppl) S731–41.
98. Neuzil KM, Jackson LA, Nelson J, et al. **Immunogenicity and reactogenicity of 1 versus 2 doses of trivalent inactivated influenza vaccine in vaccine-naive 5–8–year-old children.** J Infect Dis 2006;194:1032–9.
99. Walter EB, Neuzil KM, Zhu Y, et al. Influenza vaccine immunogenicity in 6– to 23–month-old children: are identical antigens necessary for priming? Pediatrics 2006;118:e570–8.
100. Englund JA, Walter EB, Gbadebo A, et al. Immunization with trivalent inactivated influenza vaccine in partially immunized toddlers. Pediatrics 2006;118:e579–85.
101. Englund JA, Walter EB, Fairchok MP, et al. **A comparison of 2 influenza vaccine schedules in 6– to 23–month-old children.** Pediatrics 2005;115:1039–47.
102. Allison MA, Daley MF, Crane LA, et al. Influenza vaccine effectiveness in healthy 6– to 21–month-old children during the 2003–2004 season. J Pediatr 2006;149:755–762.
103. Bell TD, Chai H, Berlow B, et al. Immunization with killed influenza virus in children with chronic asthma. Chest 1978;73:140–5.
104. Groothuis JR, Lehr MV, Levin MJ. Safety and immunogenicity of a purified haemagglutinin antigen in very young high-risk children. Vaccine 1994;12:139–41.
105. Park CL, Frank AL, Sullivan M, et al. Influenza vaccination of children during acute asthma exacerbation and concurrent prednisone therapy. Pediatrics 1996;98:196–200.
106. Ritzwoller DP, Bridges CB, Shetterly S, et al. Effectiveness of the 2003–2004 influenza vaccine among children 6 months to 8 years of age, with 1 vs 2 doses. Pediatrics 2005;116:153–9.
107. Shuler CM, Iwamoto M, Bridges CB, et al. Vaccine effectiveness against medically attended, laboratory-confirmed influenza among children aged 6 to 59 months, 2003–2004. Pediatrics 2007;119:e587–95.
108. Clover RD, Crawford S, Glezen WP, et al. Comparison of heterotypic protection against influenza A/Taiwan/86 (H1N1) by attenuated and inactivated vaccines to A/Chile/83–like viruses. J Infect Dis 1991;163:300–4.
109. Hoberman A, Greenberg DP, Paradise JL, et al. **Effectiveness of inactivated influenza vaccine in preventing acute otitis media in young children: a randomized controlled trial.** JAMA 2003;290:1608–16.
110. Eisenberg KW, Szilagyi PG, Fairbrother G, et al. Vaccine effectiveness against laboratory-confirmed influenza in children 6 to 59 months of age during the 2003–2004 and 2004–2005 influenza seasons. Pediatrics 2008;122:911–9.
111. Zangwill KM, Belshe RB. Safety and efficacy of trivalent inactivated influenza vaccine in young children: a summary for the new era of routine vaccination. Pediatr Infect Dis J 2004;23:189–97.
112. Jefferson T, Rivetti A, Harnden A, et al. Vaccines for preventing influenza in healthy children. Cochrane Database Syst Rev 2008:CD004879.
113. Sugaya N, Nerome K, Ishida M, et al. Efficacy of inactivated vaccine in preventing antigenically drifted influenza type A and well-matched type B. JAMA 1994;272:1122–6.
114. Kramarz P, Destefano F, Gargiullo PM, et al. Does influenza vaccination prevent asthma exacerbations in children? J Pediatr 2001;138:306–10..
115. Bueving HJ, Bernsen RM, de Jongste JC, et al. Influenza vaccination in children with asthma: randomized double-blind placebo-controlled trial. Am J Respir Crit Care Med 2004;169:488–93.
116. Clements DA, Langdon L, Bland C, et al. Influenza A vaccine decreases the incidence of otitis media in 6– to 30–month-old children in day care. Arch Pediatr Adolesc Med 1995;149:1113–7.

117. Heikkinen T, Ruuskanen O, Waris M, et al. Influenza vaccination in the prevention of acute otitis media in children. Am J Dis Child 1991;145:445–8.
118. Gross PA, Weksler ME, Quinnan GV Jr, et al. Immunization of elderly people with two doses of influenza vaccine. J Clin Microbiol 1987;25:1763–5.
119. Feery BJ, Cheyne IM, Hampson AW, et al. Antibody response to one and two doses of influenza virus subunit vaccine. Med J Aust 1976;1:186, 188–9.
120. Levine M, Beattie BL, McLean DM. Comparison of one- and two-dose regimens of influenza vaccine for elderly men. CMAJ 1987;137:722–6.
121. Bridges CB, Thompson WW, Meltzer MI, et al. Effectiveness and cost-benefit of influenza vaccination of healthy working adults: a randomized controlled trial. JAMA 2000;284:1655–63.
122. Jefferson TO, Rivetti D, Di Pietrantonj C, et al. Vaccines for preventing influenza in healthy adults. Cochrane Database Syst Rev 2007:CD001269.
123. Nichol KL, Lind A, Margolis KL, et al. The effectiveness of vaccination against influenza in healthy, working adults. N Engl J Med 1995;333:889–93.
124. Campbell DS, Rumley MH. Cost-effectiveness of the influenza vaccine in a healthy, working-age population. J Occup Environ Med 1997;39:408–14.
125. Herrera GA, Iwane MK, Cortese M, et al. Influenza vaccine effectiveness among 50–64–year-old persons during a season of poor antigenic match between vaccine and circulating influenza virus strains: Colorado, United States, 2003–2004. Vaccine 2007;25:154–60.
126. Blumberg EA, Albano C, Pruett T, et al. The immunogenicity of influenza virus vaccine in solid organ transplant recipients. Clin Infect Dis 1996;22:295–302.
127. Dorrell L, Hassan I, Marshall S, et al. Clinical and serological responses to an inactivated influenza vaccine in adults with HIV infection, diabetes, obstructive airways disease, elderly adults and healthy volunteers. Int J STD AIDS 1997;8:776–9.
128. Wongsurkiat P, Maranetra KN, Wasi C, et al. Acute respiratory illness in patients with COPD and the effectiveness of influenza vaccination. Chest 2004;125:2011–20.
129. Gurfinkel EP, Leon de la Fuente R, Mendiz O, et al. Flu vaccination in acute coronary syndromes and planned percutaneous coronary interventions (FLUVACS) Study. Eur Heart J 2004;25:25–31.
130. Ciszewski A, Bilinska ZT, Brydak LB, et al. Influenza vaccination in secondary prevention from coronary ischaemic events in coronary artery disease: FLUCAD study. Eur Heart J 2008;29:1350–8.
131. Hak E, Buskens E, van Essen GA, et al. Clinical effectiveness of influenza vaccination in persons younger than 65 years with high-risk medical conditions: the PRISMA study. Arch Intern Med 2005;165:274–80.
132. Hak E, Buskens E, Nichol KL, et al. Do recommended high-risk adults benefit from a first influenza vaccination? Vaccine 2006;24:2799–802.
133. Looijmans-Van den Akker I, Verheij TJ, Buskens E, et al. Clinical effectiveness of first and repeat influenza vaccination in adult and elderly diabetic patients. Diabetes Care 2006;29:1771–6.
134. Cates CJ, Jefferson TO, Rowe BH. Vaccines for preventing influenza in people with asthma. Cochrane Database Syst Rev 2008:CD000364.
135. Poole PJ, Chacko E, Wood-Baker RW, et al. Influenza vaccine for patients with chronic obstructive pulmonary disease. Cochrane Database Syst Rev 2006:CD002733.
136. Chadwick EG, Chang G, Decker MD, et al. Serologic response to standard inactivated influenza vaccine in human immunodeficiency virus-infected children. Pediatr Infect Dis J 1994;13:206–11.
137. Huang KL, Ruben FL, Rinaldo CR Jr, et al. Antibody responses after influenza and pneumococcal immunization in HIV-infected homosexual men. JAMA 1987;257:2047–50.
138. Staprans SI, Hamilton BL, Follansbee SE, et al. Activation of virus replication after vaccination of HIV-1–infected individuals. J Exp Med 1995;182:1727–37.
139. Kroon FP, van Dissel JT, de Jong JC, et al. Antibody response after influenza vaccination in HIV-infected individuals: a consecutive 3–year study. Vaccine 2000;18:3040–9.
140. Miotti PG, Nelson KE, Dallabetta GA, et al. The influence of HIV infection on antibody responses to a two-dose regimen of influenza vaccine. JAMA 1989;262:779–83.
141. Scharpe J, Evenepoel P, Maes B, et al. Influenza vaccination is efficacious and safe in renal transplant recipients. Am J Transplant 2008;8:332–7.
142. Edvardsson VO, Flynn JT, Deforest A, et al. Effective immunization against influenza in pediatric renal transplant recipients. Clin Transplant 1996;10:556–60.
143. Fraund S, Wagner D, Pethig K, et al. Influenza vaccination in heart transplant recipients. J Heart Lung Transplant 1999;18:220–5.
144. Lawal A, Basler C, Branch A, et al. Influenza vaccination in orthotopic liver transplant recipients: absence of post administration ALT elevation. Am J Transplant 2004;4:1805–9.
145. Madan RP, Tan M, Fernandez-Sesma A, et al. A prospective, comparative study of the immune response to inactivated influenza vaccine in pediatric liver transplant recipients and their healthy siblings. Clin Infect Dis 2008;46:712–8.
146. Duchini A, Hendry RM, Nyberg LM, et al. Immune response to influenza vaccine in adult liver transplant recipients. Liver Transpl 2001;7:311–3.
147. Sumaya CV, Gibbs RS. Immunization of pregnant women with influenza A/New Jersey/76 virus vaccine: reactogenicity and immunogenicity in mother and infant. J Infect Dis 1979;140:141–6.
148. Munoz FM, Greisinger AJ, Wehmanen OA, et al. Safety of influenza vaccination during pregnancy. Am J Obstet Gynecol 2005;192:1098–106.
149. Englund JA, Mbawuike IN, Hammill H, et al. Maternal immunization with influenza or tetanus toxoid vaccine for passive antibody protection in young infants. J Infect Dis 1993;168:647–56.
150. Puck JM, Glezen WP, Frank AL, et al. Protection of infants from infection with influenza A virus by transplacentally acquired antibody. J Infect Dis 1980;142:844–9.
151. Reuman PD, Ayoub EM, Small PA. Effect of passive maternal antibody on influenza illness in children: a prospective study of influenza A in mother-infant pairs. Pediatr Infect Dis J 1987;6:398–403.
152. Black SB, Shinefield HR, France EK, et al. Effectiveness of influenza vaccine during pregnancy in preventing hospitalizations and outpatient visits for respiratory illness in pregnant women and their infants. Am J Perinatol 2004;21:333–9.
153. France EK, Smith-Ray R, McClure D, et al. Impact of maternal influenza vaccination during pregnancy on the incidence of acute respiratory illness visits among infants. Arch Pediatr Adolesc Med 2006;160:1277–83.
154. Zaman K, Roy E, Arifeen SE, et al. Effectiveness of maternal influenza immunization in mothers and infants. N Engl J Med 2008;359:1555–64.

155. McElhaney JE. The unmet need in the elderly: designing new influenza vaccines for older adults. Vaccine 2005;23(Suppl 1):S10–25.
156. Goodwin K, Viboud C, Simonsen L. Antibody response to influenza vaccination in the elderly: a quantitative review. Vaccine 2006;24:1159–69.
157. Skowronski DM, Tweed SA, De Serres G. Rapid decline of influenza vaccine-induced antibody in the elderly: is it real, or is it relevant? J Infect Dis 2008;197:490–502.
158. Berry BB, Ehlert DA, Battiola RJ, et al. Influenza vaccination is safe and immunogenic when administered to hospitalized patients. Vaccine 2001;19:3493–8.
159. Govaert TM, Thijs CT, Masurel N, et al. The efficacy of influenza vaccination in elderly individuals. A randomized double-blind placebo-controlled trial. JAMA 1994;272:1661–5.
160. Thijs C, Beyer WE, Govaert PM, et al. Mortality benefits of influenza vaccination in elderly people. Lancet Infect Dis 2008;8:460–1; author reply 463–5.
161. Monto AS, Hornbuckle K, Ohmit SE. Influenza vaccine effectiveness among elderly nursing home residents: a cohort study. Am J Epidemiol 2001;154:155–60.
162. Ohmit SE, Arden NH, Monto AS. Effectiveness of inactivated influenza vaccine among nursing home residents during an influenza type A (H3N2) epidemic. J Am Geriatr Soc 1999;47:165–71.
163. Coles FB, Balzano GJ, Morse DL. An outbreak of influenza A (H3N2) in a well immunized nursing home population. J Am Geriatr Soc 1992;40:589–92.
164. Libow LS, Neufeld RR, Olson E, et al. Sequential outbreak of influenza A and B in a nursing home: efficacy of vaccine and amantadine. J Am Geriatr Soc 1996;44:1153–7.
165. Arden N, Patriarcha P, Kendal A. Experiences in the use and efficacy of inactivated influenza vaccine in nursing homes. In: Kendal A, Patriarca P, eds. Options for the control of influenza. New York, NY: Alan R. Liss, Inc.; 1986.
166. Jefferson T, Rivetti D, Rivetti A, et al. Efficacy and effectiveness of influenza vaccines in elderly people: a systematic review. Lancet 2005;366:1165–74.
167. Patriarca PA, Weber JA, Parker RA, et al. Efficacy of influenza vaccine in nursing homes. Reduction in illness and complications during an influenza A (H3N2) epidemic. JAMA 1985;253:1136–9.
168. Nichol KL, Wuorenma J, von Sternberg T. Benefits of influenza vaccination for low-, intermediate-, and high-risk senior citizens. Arch Intern Med 1998;158:1769–76.
169. Mullooly JP, Bennett MD, Hornbrook MC, et al. Influenza vaccination programs for elderly persons: cost-effectiveness in a health maintenance organization. Ann Intern Med 1994;121:947–52.
170. Nichol KL, Nordin JD, Nelson DB, et al. Effectiveness of influenza vaccine in the community-dwelling elderly. N Engl J Med 2007;357:1373–81.
171. Gross PA, Hermogenes AW, Sacks HS, et al. The efficacy of influenza vaccine in elderly persons. A meta-analysis and review of the literature. Ann Intern Med 1995;123:518–27.
172. Hak E, Nordin J, Wei F, et al. Influence of high-risk medical conditions on the effectiveness of influenza vaccination among elderly members of 3 large managed-care organizations. Clin Infect Dis 2002;35:370–7.
173. Nordin J, Mullooly J, Poblete S, et al. Influenza vaccine effectiveness in preventing hospitalizations and deaths in persons 65 years or older in Minnesota, New York, and Oregon: data from 3 health plans. J Infect Dis 2001;184:665–70.
174. Patriarca PA, Weber JA, Parker RA, et al. Risk factors for outbreaks of influenza in nursing homes. A case-control study. Am J Epidemiol 1986;124:114–9.
175. Jackson LA, Nelson JC, Benson P, et al. Functional status is a confounder of the association of influenza vaccine and risk of all cause mortality in seniors. Int J Epidemiol 2006;35:345–52.
176. Simonsen L, Viboud C, Taylor RJ. Effectiveness of influenza vaccination. N Engl J Med 2007;357:2729–30;author reply 2730–1.
177. Nelson JC, Jackson ML, Jackson LA. Effectiveness of influenza vaccination. N Engl J Med 2007;357:2728–9; author reply 2730–1.
178. Poland GA, Borrud A, Jacobson RM, et al. Determination of deltoid fat pad thickness. Implications for needle length in adult immunization. JAMA 1997;277:1709–11.
179. CDC. General recommendations on immunization: recommendations of the Advisory Committee on Immunization Practices (ACIP). MMWR 2006;55(No. RR-15).
180. France EK, Glanz JM, Xu S, et al. Safety of the trivalent inactivated influenza vaccine among children: a population-based study. Arch Pediatr Adolesc Med 2004;158:1031–6.
181. Hambidge SJ, Glanz JM, France EK, et al. Safety of trivalent inactivated influenza vaccine in children 6 to 23 months old. JAMA 2006;296:1990–7.
182. Scheifele DW, Bjornson G, Johnston J. Evaluation of adverse events after influenza vaccination in hospital personnel. CMAJ 1990;142:127–30.
183. Barry DW, Mayner RE, Hochstein HD, et al. Comparative trial of influenza vaccines. II. Adverse reactions in children and adults. Am J Epidemiol 1976;104:47–59.
184. McMahon AW, Iskander JK, Haber P, et al. Inactivated influenza vaccine (IIV) in children <2 years of age: examination of selected adverse events reported to the Vaccine Adverse Event Reporting System (VAERS) after thimerosal-free or thimerosal-containing vaccine. Vaccine 2008;26:427–9.
185. Rosenberg M, Sparks R, McMahon A, et al. Serious adverse events rarely reported after trivalent inactivated influenza vaccine (TIV) in children 6–23 months of age. Vaccine 2009.
186. Govaert TM, Dinant GJ, Aretz K, et al. Adverse reactions to influenza vaccine in elderly people: randomised double blind placebo controlled trial. BMJ 1993;307:988–90.
187. Margolis KL, Nichol KL, Poland GA, et al. Frequency of adverse reactions to influenza vaccine in the elderly. A randomized, placebo-controlled trial. JAMA 1990;264:1139–41.
188. Nichol KL, Margolis KL, Lind A, et al. Side effects associated with influenza vaccination in healthy working adults. A randomized, placebo-controlled trial. Arch Intern Med 1996;156:1546–50.
189. Vellozzi C, Burwen DR, Dobardzic A, et al. Safety of trivalent inactivated influenza vaccines in adults: background for pandemic influenza vaccine safety monitoring. Vaccine 2009;27:2114–20.
190. Heinonen OP, Shapiro S, Monson RR, et al. Immunization during pregnancy against poliomyelitis and influenza in relation to childhood malignancy. Int J Epidemiol 1973;2:229–35.
191. Pool V, Iskander J. Safety of influenza vaccination during pregnancy. Am J Obstet Gynecol 2006;194:1200;author reply 1201.
192. Deinard AS, Ogburn P Jr. A/NJ/8/76 influenza vaccination program: effects on maternal health and pregnancy outcome. Am J Obstet Gynecol 1981;140:240–5.
193. Mak TK, Mangtani P, Leese J, et al. Influenza vaccination in pregnancy: current evidence and selected national policies. Lancet Infect Dis 2008;8:44–52.

194. Centers TALAAR. The safety of inactivated influenza vaccine in adults and children with asthma. N Engl J Med 2001;345:1529–36.
195. Kmiecik T, Arnoux S, Kobryn A, Gorski P. Influenza vaccination in adults with asthma: safety of an inactivated trivalent influenza vaccine. J Asthma 2007;44:817–22.196. Groothuis JR, Levin MJ, Rabalais GP, et al. Immunization of high-risk infants younger than 18 months of age with split-product influenza vaccine. Pediatrics 1991;87:823–8.
197. Ho DD. HIV-1 viraemia and influenza. Lancet 1992;339:1549.
198. O'Brien WA, Grovit-Ferbas K, Namazi A, et al. Human immunodeficiency virus-type 1 replication can be increased in peripheral blood of seropositive patients after influenza vaccination. Blood 1995;86:1082–9.
199. Glesby MJ, Hoover DR, Farzadegan H, et al. The effect of influenza vaccination on human immunodeficiency virus type 1 load: a randomized, double-blind, placebo-controlled study. J Infect Dis 1996;174:1332–6.
200. Fowke KR, D'Amico R, Chernoff DN, et al. Immunologic and virologic evaluation after influenza vaccination of HIV-1–infected patients. AIDS 1997;11:1013–21.
201. Fuller JD, Craven DE, Steger KA, et al. Influenza vaccination of human immunodeficiency virus (HIV)-infected adults: impact on plasma levels of HIV type 1 RNA and determinants of antibody response. Clin Infect Dis 1999;28:541–7.
202. Amendola A, Boschini A, Colzani D, et al. Influenza vaccination of HIV-1–positive and HIV-1–negative former intravenous drug users. J Med Virol 2001;65:644–8.
203. Sullivan PS, Hanson DL, Dworkin MS, et al. Effect of influenza vaccination on disease progression among HIV-infected persons. AIDS 2000;14:2781–5.
204. Gunthard HF, Wong JK, Spina CA, et al. Effect of influenza vaccination on viral replication and immune response in persons infected with human immunodeficiency virus receiving potent antiretroviral therapy. J Infect Dis 2000;181:522–31.
205. Wood RA, Berger M, Dreskin SC, et al. An algorithm for treatment of patients with hypersensitivity reactions after vaccines. Pediatrics 2008;122:e771–7.
206. Ruggeberg JU, Gold MS, Bayas JM, et al. Anaphylaxis: case definition and guidelines for data collection, analysis, and presentation of immunization safety data. Vaccine 2007;25:5675–84.
207. GlaxoSmithKline Biologicals. FLULAVAL [Prescribing information]. Research Triangle Park, NC: GlaxoSmithKline; 2008.
208. CSL Biotherapies Inc. AFLURIA [Prescribing information]. King of Prussia, PA: CSL Biotherapies Inc.; 2008.
209. Grabenstein JD. Clinical management of hypersensitivities to vaccine components. Hosp Pharm 1997;32:77–87.
210. Bohlke K, Davis RL, Marcy SM, et al. Risk of anaphylaxis after vaccination of children and adolescents. Pediatrics 2003;112:815–20.
211. Tey D, Heine RG. Egg allergy in childhood: an update. Curr Opin Allergy Clin Immunol 2009;9:244–50.
212. James JM, Zeiger RS, Lester MR, et al. Safe administration of influenza vaccine to patients with egg allergy. J Pediatr 1998;133:624–8.
213. Murphy KR, Strunk RC. Safe administration of influenza vaccine in asthmatic children hypersensitive to egg proteins. J Pediatr 1985;106:931–3.
214. Zeiger RS. Current issues with influenza vaccination in egg allergy. J Allergy Clin Immunol 2002;110:834–40.
215. Zheng W, Dreskin SC. Thimerosal in influenza vaccine: an immediate hypersensitivity reaction. Ann Allergy Asthma Immunol 2007;99:574–5.
216. Aberer W. Vaccination despite thimerosal sensitivity. Contact Dermatitis 1991;24:6–10.
217. Kirkland LR. Ocular sensitivity to thimerosal: a problem with hepatitis B vaccine? South Med J 1990;83:497–9.
218. GlaxoSmithKline Biologicals. FLUARIX [Prescribing information]. Research Triangle Park, NC: GlaxoSmithKline; 2008.
219. Sanofi Pasteur Inc. Fluzone [Prescribing information]. Swiftwater, PA: Sanofi Pasteur Inc.; 2008.
220. Novartis. FLUVIRIN [Prescribing information]. Emeryville, CA: Novartis; 2008.
221. Ohmit SE, Victor JC, Teich ER, et al. Prevention of symptomatic seasonal influenza in 2005–2006 by inactivated and live attenuated vaccines. J Infect Dis 2008;198:312–7.
222. Ohmit SE, Victor JC, Rotthoff JR, et al. Prevention of antigenically drifted influenza by inactivated and live attenuated vaccines. N Engl J Med 2006;355:2513–22.
223. National Advisory Committee on Immunization. An Advisory Committee Statement (ACS). Supplementary statement on influenza vaccination: continued use of Fluviral influenza vaccine in the 2000–2001 season. Can Commun Dis Rep 2001;27:1–3.
224. Boulianne N, De Serres G, Duval B, et al. Clinical manifestations and incidence of oculo-respiratory syndrome following influenza vaccination—Quebec, 2000. Can Commun Dis Rep 2001;27:85–90.
225. Spila-Alegiani S, Salmaso S, Rota MC, et al. Reactogenicity in the elderly of nine commercial influenza vaccines: results from the Italian SVEVA study. Study for the evaluation of adverse events of influenza vaccination. Vaccine 1999;17:1898–904.
226. Anonymous. Oculo-respiratory syndrome following influenza vaccination: review of post-marketing surveillance through four influenza seasons in Canada. Can Commun Dis Rep 2005;31:217–25.
227. Khromova A PV, Chen R. Oculo-respiratory syndrome following influenza vaccine—United States, 1990–2002: new or previously unrecognized? [Presentation].1st international conference on therapeutic risk management and 19th international conference on pharmacoepidemiology. Philadelphia, PA, USA; August 21–23, 2003.
228. Skowronski DM, De Serres G, Hebert J, et al. Skin testing to evaluate oculo-respiratory syndrome (ORS) associated with influenza vaccination during the 2000–2001 season. Vaccine 2002;20:2713–9.
229. Scheifele DW, Duval B, Russell ML, et al. Ocular and respiratory symptoms attributable to inactivated split influenza vaccine: evidence from a controlled trial involving adults. Clin Infect Dis 2003;36:850–7.
230. Skowronski DM, Strauss B, Kendall P, et al. Low risk of recurrence of oculorespiratory syndrome following influenza revaccination. CMAJ 2002;167:853–8.
231. De Serres G, Skowronski DM, Guay M, et al. Recurrence risk of oculorespiratory syndrome after influenza vaccination: randomized controlled trial of previously affected persons. Arch Intern Med 2004;164:2266–72.
232. Ropper AH. The Guillain-Barre syndrome. N Engl J Med 1992;326:1130–6.
233. Guarino M, Casmiro M, D'Alessandro R. *Campylobacter jejuni* infection and Guillain-Barre syndrome: a case-control study. Emilia-Romagna Study Group on Clinical and Epidemiological problems in neurology. Neuroepidemiology 1998;17:296–302.
234. Jacobs BC, Rothbarth PH, van der Meche FG, et al. The spectrum of antecedent infections in Guillain-Barre syndrome: a case-control study. Neurology 1998;51:1110–5.

235. Sheikh KA, Nachamkin I, Ho TW, et al. *Campylobacter jejuni* lipopolysaccharides in Guillain-Barre syndrome: molecular mimicry and host susceptibility. Neurology 1998;51:371–8.
236. Sivadon-Tardy V, Orlikowski D, Porcher R, et al. Guillain-Barre syndrome and influenza virus infection. Clin Infect Dis 2009;48:48–56.
237. Haber P, DeStefano F, Angulo FJ, et al. Guillain-Barre syndrome following influenza vaccination. JAMA 2004;292:2478–81.
238. Lasky T, Terracciano GJ, Magder L, et al. The Guillain-Barre syndrome and the 1992–1993 and 1993–1994 influenza vaccines. N Engl J Med 1998;339:1797–802.
239. Schonberger LB, Bregman DJ, Sullivan-Bolyai JZ, et al. Guillain-Barre syndrome following vaccination in the National Influenza Immunization Program, United States, 1976–1977. Am J Epidemiol 1979;110:105–23.
240. Hurwitz ES, Schonberger LB, Nelson DB, et al. Guillain-Barre syndrome and the 1978–1979 influenza vaccine. N Engl J Med 1981;304:1557–61.
241. Kaplan JE, Katona P, Hurwitz ES, et al. Guillain-Barre syndrome in the United States, 1979–1980 and 1980–1981. Lack of an association with influenza vaccination. JAMA 1982;248:698–700.
242. Chen R, Kent J, Rhodes P, et al. Investigations of a possible association between influenza vaccination and Guillain-Barre syndrome in the United States, 1990–1991 [Abstract 040]. Post Marketing Surveillance 1992;6:5–6.
243. Juurlink DN, Stukel TA, Kwong J, et al. Guillain-Barre syndrome after influenza vaccination in adults: a population-based study. Arch Intern Med 2006;166:2217–21.
244. Tam CC, O'Brien SJ, Petersen I, et al. Guillain-Barre syndrome and preceding infection with campylobacter, influenza and Epstein-Barr virus in the general practice research database. PLoS ONE 2007;2:e344.
245. Hughes RA, Charlton J, Latinovic R, et al. No association between immunization and Guillain-Barre syndrome in the United Kingdom, 1992 to 2000. Arch Intern Med 2006;166:1301–4.
246. Stowe J, Andrews N, Wise L, et al. Investigation of the temporal association of Guillain-Barre syndrome with influenza vaccine and influenzalike illness using the United Kingdom General Practice Research Database. Am J Epidemiol 2009;169:382–8.
247. Pritchard J, Mukherjee R, Hughes RA. Risk of relapse of Guillain-Barre syndrome or chronic inflammatory demyelinating polyradiculoneuropathy following immunisation. J Neurol Neurosurg Psychiatry 2002;73:348–9.
248. CDC. Recommendations regarding the use of vaccines that contain thimerosal as a preservative. MMWR 1999;48:996–8.
249. CDC. Summary of the joint statement on thimerosal in vaccines. MMWR 2000;49:622, 631.
250. McCormick M, Bayer R, Berg A, et al. Report of the Institute of Medicine. Immunization safety review: vaccines and autism. Washington, DC: Institute of Medicine; 2004.
251. Pichichero ME, Cernichiari E, Lopreiato J, et al. Mercury concentrations and metabolism in infants receiving vaccines containing thiomersal: a descriptive study. Lancet 2002;360:1737–41.
252. Verstraeten T, Davis RL, DeStefano F, et al. Safety of thimerosal-containing vaccines: a two-phased study of computerized health maintenance organization databases. Pediatrics 2003;112:1039–48.
253. Tozzi AE, Bisiacchi P, Tarantino V, et al. Neuropsychological performance 10 years after immunization in infancy with thimerosal-containing vaccines. Pediatrics 2009;123:475–82.
254. Schechter R, Grether JK. Continuing increases in autism reported to California's developmental services system: mercury in retrograde. Arch Gen Psychiatry 2008;65:19–24.
255. Pichichero ME, Gentile A, Giglio N, et al. Mercury levels in newborns and infants after receipt of thimerosal-containing vaccines. Pediatrics 2008;121:e208–14.
256. Thompson WW, Price C, Goodson B, et al. Early thimerosal exposure and neuropsychological outcomes at 7 to 10 years. N Engl J Med 2007;357:1281–92.
257. Parker SK, Schwartz B, Todd J, Pickering LK. Thimerosal-containing vaccines and autistic spectrum disorder: a critical review of published original data. Pediatrics 2004;114:793–804.
258. Croen LA, Matevia M, Yoshida CK, et al. Maternal Rh D status, anti-D immune globulin exposure during pregnancy, and risk of autism spectrum disorders. Am J Obstet Gynecol 2008;199:234 e1–6.
259. Stratton K, Gable A, McCormick M., eds. Report of the Institute of Medicine. Immunization safety review: thimerosal-containing vaccines and neurodevelopmental disorders. Washington, DC: Institute of Medicine; 2001.
260. Gostin LO. Medical countermeasures for pandemic influenza: ethics and the law. JAMA 2006;295:554–6.
261. Medimmune Vaccines, Inc. FluMist [Package insert]. Gaithersburg, MD: Medimmune Vaccines, Inc.; 2007.
262. Vesikari T, Karvonen A, Korhonen T, et al. A randomized, double-blind study of the safety, transmissibility and phenotypic and genotypic stability of cold-adapted influenza virus vaccine. Pediatr Infect Dis J 2006;25:590–5.
263. Block SL, Yogev R, Hayden FG, et al. Shedding and immunogenicity of live attenuated influenza vaccine virus in subjects 5–49 years of age. Vaccine 2008;26:4940–6.
264. Talbot TR, Crocker DD, Peters J, et al. Duration of virus shedding after trivalent intranasal live attenuated influenza vaccination in adults. Infect Control Hosp Epidemiol 2005;26:494–500.
265. Ali T, Scott N, Kallas W, et al. Detection of influenza antigen with rapid antibody-based tests after intranasal influenza vaccination (FluMist). Clin Infect Dis 2004;38:760–2.
266. King JC Jr, Treanor J, Fast PE, et al. Comparison of the safety, vaccine virus shedding, and immunogenicity of influenza virus vaccine, trivalent, types A and B, live cold-adapted, administered to human immunodeficiency virus (HIV)-infected and non-HIV-infected adults. J Infect Dis 2000;181:725–8.
267. King JC Jr, Fast PE, Zangwill KM, et al. Safety, vaccine virus shedding and immunogenicity of trivalent, cold-adapted, live attenuated influenza vaccine administered to human immunodeficiency virus-infected and noninfected children. Pediatr Infect Dis J 2001;20:1124–31.
268. Cha TA, Kao K, Zhao J, et al. Genotypic stability of cold-adapted influenza virus vaccine in an efficacy clinical trial. J Clin Microbiol 2000;38:839–45.
269. Buonagurio DA, O'Neill RE, Shutyak L, et al. Genetic and phenotypic stability of cold-adapted influenza viruses in a trivalent vaccine administered to children in a day care setting. Virology 2006;347:296–306.
270. King JC Jr, Lagos R, Bernstein DI, et al. Safety and immunogenicity of low and high doses of trivalent live cold-adapted influenza vaccine administered intranasally as drops or spray to healthy children. J Infect Dis 1998;177:1394–7.
271. Lee MS, Mahmood K, Adhikary L, et al. Measuring antibody responses to a live attenuated influenza vaccine in children. Pediatr Infect Dis J 2004;23:852–6.

272. Zangwill KM, Droge J, Mendelman P, et al. Prospective, randomized, placebo-controlled evaluation of the safety and immunogenicity of three lots of intranasal trivalent influenza vaccine among young children. Pediatr Infect Dis J 2001;20:740–6.
273. Nolan T, Lee MS, Cordova JM, et al. Safety and immunogenicity of a live-attenuated influenza vaccine blended and filled at two manufacturing facilities. Vaccine 2003;21:1224–31.
274. Bernstein DI, Yan L, Treanor J, et al. Effect of yearly vaccinations with live, attenuated, cold-adapted, trivalent, intranasal influenza vaccines on antibody responses in children. Pediatr Infect Dis J 2003;22:28–34.
275. Belshe RB, Gruber WC, Mendelman PM, et al. Correlates of immune protection induced by live, attenuated, cold-adapted, trivalent, intranasal influenza virus vaccine. J Infect Dis 2000;181:1133–7.
276. Boyce TG, Gruber WC, Coleman-Dockery SD, et al. Mucosal immune response to trivalent live attenuated intranasal influenza vaccine in children. Vaccine 1999;18:82–8.
277. Belshe RB, Mendelman PM, Treanor J, et al. The efficacy of live attenuated, cold-adapted, trivalent, intranasal influenzavirus vaccine in children. N Engl J Med 1998;338:1405–12.
278. Belshe RB, Gruber WC, Mendelman PM, et al. Efficacy of vaccination with live attenuated, cold-adapted, trivalent, intranasal influenza virus vaccine against a variant (A/Sydney) not contained in the vaccine. J Pediatr 2000;136:168–75.
279. Belshe RB, Gruber WC. Prevention of otitis media in children with live attenuated influenza vaccine given intranasally. Pediatr Infect Dis J 2000;19:S66–71.
280. Vesikari T, Fleming DM, Aristegui JF, et al. Safety, efficacy, and effectiveness of cold-adapted influenza vaccine-trivalent against community-acquired, culture-confirmed influenza in young children attending day care. Pediatrics 2006;118:2298–312.
281. Tam JS, Capeding MR, Lum LC, et al. Efficacy and safety of a live attenuated, cold-adapted influenza vaccine, trivalent against culture-confirmed influenza in young children in Asia. Pediatr Infect Dis J 2007;26:619–28.
282. Gaglani MJ, Piedra PA, Herschler GB, et al. Direct and total effectiveness of the intranasal, live-attenuated, trivalent cold-adapted influenza virus vaccine against the 2000–2001 influenza A(H1N1) and B epidemic in healthy children. Arch Pediatr Adolesc Med 2004;158:65–73.
283. Nichol KL, Mendelman PM, Mallon KP, et al. Effectiveness of live, attenuated intranasal influenza virus vaccine in healthy, working adults: a randomized controlled trial. JAMA 1999;282:137–44.
284. Redding G, Walker RE, Hessel C, et al. Safety and tolerability of cold-adapted influenza virus vaccine in children and adolescents with asthma. Pediatr Infect Dis J 2002;21:44–8.
285. Piedra PA, Yan L, Kotloff K, et al. Safety of the trivalent, cold-adapted influenza vaccine in preschool-aged children. Pediatrics 2002;110:662–72.
286. Bergen R, Black S, Shinefield H, et al. Safety of cold-adapted live attenuated influenza vaccine in a large cohort of children and adolescents. Pediatr Infect Dis J 2004;23:138–44.
287. Belshe RB, Ambrose CSYi T. Safety and efficacy of live attenuated influenza vaccine in children 2–7 years of age. Vaccine 2008;26(Suppl 4):D10–6.
288. Belshe RB, Edwards KM, Vesikari T, et al. Live attenuated versus inactivated influenza vaccine in infants and young children. N Engl J Med 2007;356:685–96.
289. Piedra PA, Gaglani MJ, Riggs M, et al. **Live attenuated influenza vaccine, trivalent, is safe in healthy children 18 months to 4 years, 5 to 9 years, and 10 to 18 years of age in a community-based, nonrandomized, open-label trial.** Pediatrics 2005;116:e397–407.
290. Gaglani MJ, Piedra PA, Riggs M, et al. Safety of the intranasal, trivalent, live attenuated influenza vaccine (LAIV) in children with intermittent wheezing in an open-label field trial. Pediatr Infect Dis J 2008;27:444–52.
291. MedImmune, FluMist [Prescribing information]. Gaithersburg, MD: Medimmune Vaccines, Inc.; 2007.
292. Izurieta HS, Haber P, Wise RP, et al. **Adverse events reported following live, cold-adapted, intranasal influenza vaccine.** JAMA 2005;294:2720–5.
293. Jackson LA, Holmes SJ, Mendelman PM, et al. Safety of a trivalent live attenuated intranasal influenza vaccine, FluMist, administered in addition to parenteral trivalent inactivated influenza vaccine to seniors with chronic medical conditions. Vaccine 1999;17:1905–9.
294. Treanor JJ, Kotloff K, Betts RF, et al. Evaluation of trivalent, live, cold-adapted (CAIV-T) and inactivated (TIV) influenza vaccines in prevention of virus infection and illness following challenge of adults with wild-type influenza A (H1N1), A (H3N2), and B viruses. Vaccine 1999;18:899–906.
295. Piedra PA, Gaglani MJ, Kozinetz CA, et al. Trivalent live attenuated intranasal influenza vaccine administered during the 2003–2004 influenza type A (H3N2) outbreak provided immediate, direct, and indirect protection in children. Pediatrics 2007;120:e553–64.
296. Wang Z, Tobler S, Roayaei J, et al. Live attenuated or inactivated influenza vaccines and medical encounters for respiratory illnesses among US military personnel. JAMA 2009;301:945–53
297. Fleming DM, Crovari P, Wahn U, et al. Comparison of the efficacy and safety of live attenuated cold-adapted influenza vaccine, trivalent, with trivalent inactivated influenza virus vaccine in children and adolescents with asthma. Pediatr Infect Dis J 2006;25:860–9.
298. Ashkenazi S, Vertruyen A, Aristegui J, et al. Superior relative efficacy of live attenuated influenza vaccine compared with inactivated influenza vaccine in young children with recurrent respiratory tract infections. Pediatr Infect Dis J 2006;25:870–9.
299. Wilde JA, McMillan JA, Serwint J, et al. Effectiveness of influenza vaccine in health care professionals: a randomized trial. JAMA 1999;281:908–13.
300. Elder AG, O'Donnell B, McCruden EA, et al. Incidence and recall of influenza in a cohort of Glasgow healthcare workers during the 1993–4 epidemic: results of serum testing and questionnaire. BMJ 1996;313:1241–2.
301. Lester RT, McGeer A, Tomlinson G, et al. Use of, effectiveness of, and attitudes regarding influenza vaccine among house staff. Infect Control Hosp Epidemiol 2003;24:839–44.
302. Cunney RJ, Bialachowski A, Thornley D, et al. An outbreak of influenza A in a neonatal intensive care unit. Infect Control Hosp Epidemiol 2000;21:449–54.
303. Salgado CD, Giannetta ET, Hayden FG, et al. Preventing nosocomial influenza by improving the vaccine acceptance rate of clinicians. Infect Control Hosp Epidemiol 2004;25:923–8.
304. Sato M, Saito R, Tanabe N, et al. **Antibody response to influenza vaccination in nursing home residents and healthcare workers during four successive seasons in Niigata, Japan.** Infect Control Hosp Epidemiol 2005;26:859–66.

305. Carman WF, Elder AG, Wallace LA, et al. Effects of influenza vaccination of health-care workers on mortality of elderly people in long-term care: a randomised controlled trial. Lancet 2000;355:93–7.
306. Potter J, Stott DJ, Roberts MA, et al. Influenza vaccination of health care workers in long-term-care hospitals reduces the mortality of elderly patients. J Infect Dis 1997;175:1–6.
307. Hayward AC, Harling R, Wetten S, et al. Effectiveness of an influenza vaccine programme for care home staff to prevent death, morbidity, and health service use among residents: cluster randomised controlled trial. BMJ 2006;333:1241.
308. Thomas RE, Jefferson TO, Demicheli V, et al. Influenza vaccination for health-care workers who work with elderly people in institutions: a systematic review. Lancet Infect Dis 2006;6:273–9.
309. Hurwitz ES, Haber M, Chang A, et al. Effectiveness of influenza vaccination of day care children in reducing influenza-related morbidity among household contacts. JAMA 2000;284:1677–82.
310. Esposito S, Marchisio P, Cavagna R, et al. Effectiveness of influenza vaccination of children with recurrent respiratory tract infections in reducing respiratory-related morbidity within the households. Vaccine 2003;21:3162–8.
311. Piedra PA, Gaglani MJ, Kozinetz CA, et al. Herd immunity in adults against influenza-related illnesses with use of the trivalent-live attenuated influenza vaccine (CAIV-T) in children. Vaccine 2005;23:1540–8.
312. King JC Jr, Stoddard JJ, Gaglani MJ, et al. Effectiveness of school-based influenza vaccination. N Engl J Med 2006;355:2523–32.
313. Davis MM, King JC Jr, Moag L, et al. Countywide school-based influenza immunization: direct and indirect impact on student absenteeism. Pediatrics 2008;122:e260–5.
314. Monto AS, Davenport FM, Napier JA, et al. Modification of an outbreak of influenza in Tecumseh, Michigan by vaccination of schoolchildren. J Infect Dis 1970;122:16–25.
315. Ghendon YZ, Kaira AN, Elshina GA. The effect of mass influenza immunization in children on the morbidity of the unvaccinated elderly. Epidemiol Infect 2006;134:71–8.
316. Kwong JC, Stukel TA, Lim J, et al.. The effect of universal influenza immunization on mortality and health care use. PLoS Medicine 2008;5:e211.
317. CDC. Interim within-season estimate of the effectiveness of trivalent inactivated influenza vaccine–Marshfield, Wisconsin, 2007–08 influenza season. MMWR 2008;57:393–8.
318. CDC. Serum cross-reactive antibody response to a novel influenza A (H1N1) virus after vaccination with seasonal influenza vaccine. MMWR 2009;58:521–4.
319. Molinari NA, Ortega-Sanchez IR, Messonnier ML, et al. The annual impact of seasonal influenza in the US: measuring disease burden and costs. Vaccine 2007;25:5086–96.
320. Riddiough MA, Sisk JE, Bell JC. Influenza vaccination. JAMA 1983;249:3189–95.
321. Maciosek MV, Solberg LI, Coffield AB, et al. Influenza vaccination health impact and cost effectiveness among adults aged 50 to 64 and 65 and older. Am J Prev Med 2006;31:72–9.
322. Nichol KL. Cost-benefit analysis of a strategy to vaccinate healthy working adults against influenza. Arch Intern Med 2001;161:749–59.
323. Nichol KL, Mallon KP, Mendelman PM. Cost benefit of influenza vaccination in healthy, working adults: an economic analysis based on the results of a clinical trial of trivalent live attenuated influenza virus vaccine. Vaccine 2003;21:2207–17.
324. Meltzer MI, Neuzil KM, Griffin MR, et al. An economic analysis of annual influenza vaccination of children. Vaccine 2005;23:1004–14.
325. Keren R, Zaoutis TE, Saddlemire S, et al. Direct medical cost of influenza-related hospitalizations in children. Pediatrics 2006;118:e1321–7.
326. Prosser LA, Bridges CB, Uyeki TM, et al. Health benefits, risks, and cost-effectiveness of influenza vaccination of children. Emerg Infect Dis 2006;12:1548–58.
327. Cohen GM, Nettleman MD. Economic impact of influenza vaccination in preschool children. Pediatrics 2000;106:973–6.
328. White T, Lavoie S, Nettleman MD. Potential cost savings attributable to influenza vaccination of school-aged children. Pediatrics 1999;103:e73.
329. Luce BR, Zangwill KM, Palmer CS, et al. Cost-effectiveness analysis of an intranasal influenza vaccine for the prevention of influenza in healthy children. Pediatrics 2001;108:E24.
330. Dayan GH, Nguyen VH, Debbag R, et al. Cost-effectiveness of influenza vaccination in high-risk children in Argentina. Vaccine 2001;19:4204–13.
331. Prosser LA, O'Brien MA, Molinari NA, et al. Non-traditional settings for influenza vaccination of adults: costs and cost effectiveness. Pharmacoeconomics 2008;26:163–78.
332. Coleman MS, Fontanesi J, Meltzer MI, et al. Estimating medical practice expenses from administering adult influenza vaccinations. Vaccine 2005;23:915–23.
333. US Department of Health and Human Services. Healthy people 2000: national health promotion and disease prevention objectives—full report, with commentary. Washington, DC: US Department of Health and Human Services, Public Health Service: Washington, DC; 1991
334. US Department of Health and Human Services. Healthy People 2010, With understanding and improving health and objectives for improving health (2 vols.) Washington, DC: US Department of Health and Human Services; 2000.
335. CDC. Improving influenza, pneumococcal polysaccharide, and hepatitis B vaccination coverage among adults aged <65 years at high risk: a report on recommendations of the Task Force on Community Preventive Services. MMWR 2005;54(No. RR-5).
336. Ndiaye SM, Hopkins DP, Shefer AM, et al. Interventions to improve influenza, pneumococcal polysaccharide, and hepatitis B vaccination coverage among high-risk adults: a systematic review. Am J Prev Med 2005;28:248–79.
337. Lu P, Bridges CB, Euler GL, et al. Influenza vaccination of recommended adult populations, U.S., 1989–2005. Vaccine 2008;26:1786–93.
338. CDC. Early release of selected estimates based on data from the January–June 2008 National Health Interview Survey. Hyattsville, MD: US Department of Health and Human Services, CDC, National Center for Health Statistics; 2008.
339. CDC. Early release of selected estimates based on data from the January–September 2008 National Health Interview Survey. Hyattsville, MD: US Department of Health and Human Services, CDC, National Center for Health Statistics; 2009.
340. Zerr DM, Englund JA, Robertson AS, et al. Hospital-based influenza vaccination of children: an opportunity to prevent subsequent hospitalization. Pediatrics 2008;121:345–8.
341. Bratzler DW, Houck PM, Jiang H, et al. Failure to vaccinate Medicare inpatients: a missed opportunity. Arch Intern Med 2002;162:2349–56.
342. Verani JR, Irigoyen M, Chen S, et al. Influenza vaccine coverage and missed opportunities among inner-city children aged 6 to 23 months: 2000–2005. Pediatrics 2007;119:e580–6.

343. Fedson DS, Houck P, Bratzler D. Hospital-based influenza and pneumococcal vaccination: Sutton's Law applied to prevention. Infect Control Hosp Epidemiol 2000;21:692–9.
344. Brewer NT, Hallman WK. Subjective and objective risk as predictors of influenza vaccination during the vaccine shortage of 2004–2005. Clin Infect Dis 2006;43:1379–86.
345. CDC. Early release of selected estimates based on data from the January–September 2007 National Health Interview Survey. Hyattsville, MD: US Department of Health and Human Services, CDC, National Center for Health Statistics; 2008.
346. Hebert PL, Frick KD, Kane RL, et al. The causes of racial and ethnic differences in influenza vaccination rates among elderly Medicare beneficiaries. Health Serv Res 2005;40:517–37.
347. Winston CA, Wortley PM, Lees KA. Factors associated with vaccination of medicare beneficiaries in five U.S. communities: results from the racial and ethnic adult disparities in immunization initiative survey, 2003. J Am Geriatr Soc 2006;54:303–10.
348. Fiscella K, Dressler R, Meldrum S, et al. Impact of influenza vaccination disparities on elderly mortality in the United States. Prev Med 2007;45:83–7.
349. CDC. Influenza vaccination coverage among children with asthma–United States, 2004–05 influenza season. MMWR 2007;56:193–6.
350. Marshall BC, Henshaw C, Evans DA, et al. Influenza vaccination coverage level at a cystic fibrosis center. Pediatrics 2002;109:E80–0.
351. CDC. Childhood influenza vaccination coverage–United States, 2004–05 influenza season. MMWR 2006;55:1062–5.
352. Jackson LA, Neuzil KM, Baggs J, et al. Compliance with the recommendations for 2 doses of trivalent inactivated influenza vaccine in children less than 9 years of age receiving influenza vaccine for the first time: a Vaccine Safety Datalink study. Pediatrics 2006;118:2032–7.
353. CDC. Rapid assessment of influenza vaccination coverage among HMO members—northern California influenza seasons, 2001–02 through 2004–05. MMWR 2005;54:676–8.
354. CDC. Influenza vaccination coverage among children aged 6–23 months—United States, 2006–07 influenza season. MMWR 2008;57:1039–43.
355. Nowalk MP, Zimmerman RK, Lin CJ, et al. Parental perspectives on influenza immunization of children aged 6 to 23 months. Am J Prev Med 2005;29:210–4.
356. Gnanasekaran SK, Finkelstein JA, Hohman K, et al. Parental perspectives on influenza vaccination among children with asthma. Public Health Rep 2006;121:181–8.
357. Gaglani M, Riggs M, Kamenicky C, et al. A computerized reminder strategy is effective for annual influenza immunization of children with asthma or reactive airway disease. Pediatr Infect Dis J 2001;20:1155–60.
358. National Foundation for Infectious Diseases. Call to action: influenza immunization among health-care workers, 2003. Bethesda, MD: National Foundation for Infectious Diseases; 2003. Available at http://www.nfid.org/pdf/publications/fluhealthcarecta08.pdf.
359. Poland GA, Tosh P, Jacobson RM. Requiring influenza vaccination for health care workers: seven truths we must accept. Vaccine 2005;23:2251–5.
360. CDC. Influenza vaccination of health-care personnel: recommendations of the Healthcare Infection Control Practices Advisory Committee (HICPAC) and the Advisory Committee on Immunization Practices (ACIP). MMWR 2006;55(No. RR-2).
361. Walker Frances AJ, Singleton JA, Lu P, et al. Influenza vaccination of healthcare workers in the United States, 1989–2002. Infect Control and Hosp Epidemiol 2006;27:257–265.
362. Ofstead CL, Tucker SJ, Beebe TJ, et al. Influenza vaccination among registered nurses: information receipt, knowledge, and decision-making at an institution with a multifaceted educational program. Infect Control Hosp Epidemiol 2008;29:99–106.
363. Yeager DP, Toy EC, Baker B 3rd. Influenza vaccination in pregnancy. Am J Perinatol 1999;16:283–6.
364. Gonik BM, Jones TM, Contreras DM, et al. The obstetrician-gynecologist's role in vaccine-preventable diseases and immunization. Obstetrics & Gynecology 2000;96:81–84.
365. CDC. National Influenza Vaccination Week—November 26–December 2, 2007. MMWR 2007;56:1216–7.
366. Zimmerman RK, Raymund M, Janosky JE, et al. Sensitivity and specificity of patient self-report of influenza and pneumococcal polysaccharide vaccinations among elderly outpatients in diverse patient care strata. Vaccine 2003;21:1486–91.
367. MacDonald R, Baken L, Nelson A, et al. Validation of self-report of influenza and pneumococcal vaccination status in elderly outpatients. Am J Prev Med 1999;17:173–7.
368. Food and Drug Administration. Influenza virus vaccine 2009–2010 season. Washington, DC: Food and Drug Administration; 2009. Available at http://www.fda.gov/cber/flu/flu2009.htm.
369. Dagan R, Hall CB. Influenza A virus infection imitating bacterial sepsis in early infancy. Pediatr Infect Dis 1984;3:218–21.
370. Anonymous. Prevention of influenza: recommendations for influenza immunization of children, 2007–2008. Pediatrics 2008;121:e1016–31.
371. Talbot TR, Bradley SE, Cosgrove SE, et al. Influenza vaccination of healthcare workers and vaccine allocation for healthcare workers during vaccine shortages. Infect Control Hosp Epidemiol 2005;26:882–90.
372. Polgreen PM, Chen Y, Beekmann S, et al. Elements of influenza vaccination programs that predict higher vaccination rates: results of an emerging infections network survey. Clin Infect Dis 2008;46:14–9.
373. Polgreen PM, Septimus EJ, Parry MF, et al. Relationship of influenza vaccination declination statements and influenza vaccination rates for healthcare workers in 22 US hospitals. Infect Control Hosp Epidemiol 2008;29:675–7.
374. CDC. Interventions to increase influenza vaccination of health-care workers—California and Minnesota. MMWR 2005;54:196–9.
375. Joint Commission on Accreditation of Healthcare Organizations. New infection control requirement for offering influenza vaccination to staff and licensed independent practitioners. Jt Comm Perspect 2006;26:10–1.
376. Infectious Diseases Society of America. Pandemic and seasonal influenza: principles for U.S. action. Arlington, VA: Infectious Diseases Society of America; 2007.
377. Stewart AC, Cox M, Rosenbaum S, The epidemiology of U.S. immunization law: immunization requirements for staff and residents of long-term care facilities under state laws/regulations. Washington, DC: George Washington University; 2005.
378. Lindley MC, Horlick GA, Shefer AM, et al. Assessing state immunization requirements for healthcare workers and patients. Am J Prev Med 2007;32:459–65.
379. CDC. State immunization laws for healthcare workers and patients. Atlanta, GA: US Department of Health and Human Services, CDC; 2009. Available at http://www2a.cdc.gov/nip/stateVaccApp/StateVaccsApp/default.asp.

380. CDC. Guidelines for environmental infection control in health-care facilities. Recommendations of CDC and the Healthcare Infection Control Practices Advisory Committee (HICPAC). MMWR 2003;52(No. RR-10).
381. CDC. Recommended adult immunization schedule-United States, 2009. MMWR 2009;57:Q1–4.
382. Miller JM, Tam TW, Maloney S, et al. Cruise ships: high-risk passengers and the global spread of new influenza viruses. Clin Infect Dis 2000;31:433–8.
383. Uyeki TM, Zane SB, Bodnar UR, et al. Large summertime influenza A outbreak among tourists in Alaska and the Yukon Territory. Clin Infect Dis 2003;36:1095–102.
384. Mutsch M, Tavernini M, Marx A, et al. Influenza virus infection in travelers to tropical and subtropical countries. Clin Infect Dis 2005;40:1282–7.
385. Nichol KL, D'Heilly S, Ehlinger E. Colds and influenza-like illnesses in university students: impact on health, academic and work performance, and health care use. Clin Infect Dis 2005;40:1263–70.
386. Awofeso N, Fennell M, Waliuzzaman Z, et al. Influenza outbreak in a correctional facility. Aust N Z J Public Health 2001;25:443–6.
387. CDC. Expansion of use of live attenuated influenza vaccine (FluMist®) to children aged 2–4 years and other FluMist changes for the 2007–08 influenza season. MMWR 2007;56:1217–9.
388. Nolan T, Bernstein DI, Block SL, et al. Safety and immunogenicity of concurrent administration of live attenuated influenza vaccine with measles-mumps-rubella and varicella vaccines to infants 12 to 15 months of age. Pediatrics 2008;121:508–16.
389. Kerzner B, Murray AV, Cheng E, et al. Safety and immunogenicity profile of the concomitant administration of ZOSTAVAX and inactivated influenza vaccine in adults aged 50 and older. J Am Geriatr Soc 2007;55:1499–507.
390. Gross PA, Russo C, Dran S, et al. Time to earliest peak serum antibody response to influenza vaccine in the elderly. Clin Diagn Lab Immunol 1997;4:491–2.
391. Brokstad KA, Cox RJ, Olofsson J, et al. Parenteral influenza vaccination induces a rapid systemic and local immune response. J Infect Dis 1995;171:198–203.
392. Lawson F, Baker V, Au D, et al. Standing orders for influenza vaccination increased vaccination rates in inpatient settings compared with community rates. J Gerontol A Biol Sci Med Sci 2000;55:M522–6.
393. Centers for Medicare and Medicaid Services. Medicare and Medicaid programs; conditions of participation: immunization standards for hospitals, long-term care facilities, and home health agencies. Final rule with comment period. Fed Regist 2002;67:61808–14.
394. Centers for Medicare and Medicaid Services. Emergency update to the 2007 Medicare Physician Fee Schedule Database (MPFSDB). Washington, DC: US Department of Health and Human Services, Centers for Medicare and Medicaid Services; 2009. Available at http://www.cms.hhs.gov/MLNMattersArticles/downloads/MM5459.pdf.
395. Centers for Medicare and Medicaid Services. 2006–2007 influenza (flu) season resources for health care professionals. Washington, DC: US Department of Health and Human Services, Centers for Medicare and Medicaid Services; 2009. Available at http://www.cms.hhs.gov/MLNMattersArticles/downloads/SE0667.pdf.
396. CDC. Use of standing orders programs to increase adult vaccination rates. MMWR 2000;49(No. RR-1):15–26.
397. Rue-Cover A, Iskander J, Lyn S, et al. Death and serious illness following influenza vaccination: a multidisciplinary investigation. Pharmacoepidemiol Drug Saf 2009;18:504–11.
398. Stefanacci RG. Creating artificial barriers to vaccinations. J Am Med Dir Assoc 2005;6:357–8.
399. CMS. Medicare and Medicaid programs; condition of participation: immunization standard for long term care facilities. Final rule. Fed Regist 2005;70:58833–52.
400. Simonsen L, Reichert TA, Viboud C, et al. Impact of influenza vaccination on seasonal mortality in the US elderly population. Arch Intern Med 2005;165:265–72.
401. Nichol KL, Nordin J, Mullooly J. Influence of clinical outcome and outcome period definitions on estimates of absolute clinical and economic benefits of influenza vaccination in community dwelling elderly persons. Vaccine 2006;24:1562–8.
402. Nachamkin I, Shadomy SV, Moran AP, et al. Anti-ganglioside antibody induction by swine (A/NJ/1976/H1N1) and other influenza vaccines: insights into vaccine-associated Guillain-Barre syndrome. J Infect Dis 2008;198:226–33.
403. Weycker D, Edelsberg J, Halloran ME, et al. Population-wide benefits of routine vaccination of children against influenza. Vaccine 2005;23:1284–93.
404. Longini IM Jr, Halloran ME. Strategy for distribution of influenza vaccine to high-risk groups and children. Am J Epidemiol 2005;161:303–6.
405. Jordan R, Connock M, Albon E, et al. Universal vaccination of children against influenza: are there indirect benefits to the community? A systematic review of the evidence. Vaccine 2006;24:1047–62.
406. Schwartz B, Hinman A, Abramson J, et al. Universal influenza vaccination in the United States: are we ready? Report of a meeting. J Infect Dis 2006;194 Suppl 2:S147–54.
407. Abramson JS, Neuzil KM, Tamblyn SE. Annual universal influenza vaccination: ready or not? Clin Infect Dis 2006;42:132–5.
408. Glezen WP. Herd protection against influenza. J Clin Virol 2006;37:237–43.
409. Helms CM, Guerra FA, Klein JO, et al. Strengthening the nation's influenza vaccination system: a National Vaccine Advisory Committee assessment. Am J Prev Med 2005;29:221–6.
410. Council of State and Territorial Epidemiologists. Interim position statement 07-ID-01: national reporting for initial detections of novel influenza A viruses. Atlanta, GA: Council of State and Territorial Epidemiologists; 2007. Available at http://www.cste.org/PS/2007ps/ID/07-ID-01.pdf.
411. World Health Organization. Update: WHO-confirmed human cases of avian influenza A (H5N1) infection, November 2003–May 2008. Wkly Epidemiol Rec 2008;83:415–20.
412. Kandun IN, Wibisono H, Sedyaningsih ER, et al. Three Indonesian clusters of H5N1 virus infection in 2005. N Engl J Med 2006;355:2186–94.
413. Oner AF, Bay A, Arslan S, et al. Avian influenza A (H5N1) infection in eastern Turkey in 2006. N Engl J Med 2006;355:2179–85.
414. Areechokchai D, Jiraphongsa C, Laosiritaworn Y, et al. Investigation of avian influenza (H5N1) outbreak in humans—Thailand, 2004. MMWR 2006;55 Suppl 1:3–6.
415. Dinh PN, Long HT, Tien NT, et al. Risk factors for human infection with avian influenza A H5N1, Vietnam, 2004. Emerg Infect Dis 2006;12:1841–7.
416. Gilsdorf A, Boxall N, Gasimov V, et al. Two clusters of human infection with influenza A/H5N1 virus in the Republic of Azerbaijan, February-March 2006. Euro Surveill 2006;11:122–6.

417. WHO. Update: WHO-confirmed human cases of avian influenza A(H5N1) infection, 25 November 2003–24 November 2006. Wkly Epidemiol Rec 2007;82:41–8.
418. Kandun IN, Tresnaningsih E, Purba WH, et al. Factors associated with case fatality of human H5N1 virus infections in Indonesia: a case series. Lancet 2008;372:744–9.
419. Yu H, Gao Z, Feng Z, et al. Clinical characteristics of 26 human cases of highly pathogenic avian influenza A (H5N1) virus infection in China. PLoS ONE 2008;3:e2985.
420. Wang H, Feng Z, Shu Y, et al. Probable limited person-to-person transmission of highly pathogenic avian influenza A (H5N1) virus in China. Lancet 2008;371:1427–34.
421. Abdel-Ghafar AN, Chotpitayasunondh T, Gao Z, et al. Update on avian influenza A (H5N1) virus infection in humans. N Engl J Med 2008;358:261–73.
422. Monto AS. The threat of an avian influenza pandemic. N Engl J Med 2005;352:323–5.
423. Maines TR, Chen LM, Matsuoka Y, et al. Lack of transmission of H5N1 avian-human reassortant influenza viruses in a ferret model. Proc Natl Acad Sci U S A 2006;103:12121–6.
424. CDC. Updated interim guidance for laboratory testing of persons with suspected infection with highly pathogenic avian influenza A (H5N1) virus in the United States. Atlanta, GA: US Department of Health and Human Services, CDC; 2009. Available at http://www.cdc.gov/flu/avian/professional/guidance-labtesting.htm.
425. CDC. Guidance for follow-up of contacts of persons with suspected infection with highly pathogenic avian influenza A (H5N1) virus in the United States. Atlanta, GA: US Department of Health and Human Services, CDC; 2009. Available at http://www.cdc.gov/flu/avian/professional/guidance-followup.htm.
426. Nguyen-Van-Tam JS, Nair P, Acheson P, et al. Outbreak of low pathogenicity H7N3 avian influenza in UK, including associated case of human conjunctivitis. Euro Surveill 2006;11:E060504 2.
427. Kurtz J, Manvell RJ, Banks J. Avian influenza virus isolated from a woman with conjunctivitis. Lancet 1996;348:901–2.
428. Peiris M, Yuen KY, Leung CW, et al. Human infection with influenza H9N2. Lancet 1999;354:916–7.
429. CDC. Update: influenza activity—United States and worldwide, 2003–04 season, and composition of the 2004–05 influenza vaccine. MMWR 2004;53:547–52.
430. Uyeki TM, Chong YH, Katz JM, et al. Lack of evidence for human-to-human transmission of avian influenza A (H9N2) viruses in Hong Kong, China 1999. Emerg Infect Dis 2002;8:154–9.
431. Yuanji G. Influenza activity in China: 1998–1999. Vaccine 2002;20 Suppl 2:S28–35.
432. Editorial Team, Eurosurveillance Editorial Office. Avian influenza A/(H7N2) outbreak in the United Kingdom. Euro Surveill 2007;12:E070531 2.
433. Fouchier RA, Schneeberger PM, Rozendaal FW, et al. Avian influenza A virus (H7N7) associated with human conjunctivitis and a fatal case of acute respiratory distress syndrome. Proc Natl Acad Sci U S A 2004;101:1356–61.
434. Koopmans M, Wilbrink B, Conyn M, et al. Transmission of H7N7 avian influenza A virus to human beings during a large outbreak in commercial poultry farms in the Netherlands. Lancet 2004;363:587–93.
435. Tweed SA, Skowronski DM, David ST, et al. Human illness from avian influenza H7N3, British Columbia. Emerg Infect Dis 2004;10:2196–9.
436. Olsen CW. The emergence of novel swine influenza viruses in North America. Virus Res 2002;85:199–210.
437. Ma W, Vincent AL, Gramer MR, et al. Identification of H2N3 influenza A viruses from swine in the United States. Proc Natl Acad Sci U S A 2007;104:20949–54.
438. Myers KP, Olsen CW, Setterquist SF, et al. Are swine workers in the United States at increased risk of infection with zoonotic influenza virus? Clin Infect Dis 2006;42:14–20.
439. Dowdle WR, Hattwick MA. Swine influenza virus infections in humans. J Infect Dis 1977;136 Suppl:S386–9.
440. Myers KP, Olsen CW, Gray GC. Cases of swine influenza in humans: a review of the literature. Clin Infect Dis 2007;44:1084–8.
441. Newman AP, Reisdorf E, Beinemann J, et al. Human case of swine influenza A (H1N1) triple reassortant virus infection, Wisconsin. Emerg Infect Dis 2008;14:1470–2.
442. Dacso CC, Couch RB, Six HR, et al. Sporadic occurrence of zoonotic swine influenza virus infections. J Clin Microbiol 1984;20:833–5.
443. Gray GC, McCarthy T, Capuano AW, et al. Swine workers and swine influenza virus infections. Emerg Infect Dis 2007;13:1871–8.
444. CDC. Update: influenza activity—United States and worldwide, May 20–September 15, 2007. MMWR 2007;56:1001–4.
445. Shinde V, Bridges CB, Uyeki TM, et al. Triple-reassortant swine influenza A (H1) in humans in the United States, 2005–2009. N Engl J Med 2009.
446. Olsen CW, Brammer L, Easterday BC, et al. Serologic evidence of H1 swine Influenza virus infection in swine farm residents and employees. Emerg Infect Dis 2002;8:814–9.
447. CDC. Outbreak of swine-origin influenza A (H1N1) virus infection—Mexico, March–April 2009. MMWR 2009;58:467–70.
448. CDC. Interim guidance for protection of persons involved in U.S. avian influenza outbreak disease control and eradication activities. Atlanta, GA: US Department of Health and Human Services, CDC; 2006. Available at http://www.cdc.gov/flu/avian/professional/protect-guid.htm.
449. Occupational Safety and Health Administration. OSHA guidance update on protecting employees from avian flu (avian influenza) viruses. Washington, DC: US Department of Labor, Occupational Safety and Health Administration; 2006. Available at http://www.osha.gov/OshDoc/data_AvianFlu/avian_flu_guidance_english.pdf.
450. Dharan NJ, Gubareva LV, Meyer JJ, et al. Infections with oseltamivir-resistant influenza A(H1N1) virus in the United States. JAMA 2009;301:1034–41.
451. Lackenby A, Thompson CIDemocratis J. The potential impact of neuraminidase inhibitor resistant influenza. Curr Opin Infect Dis 2008;21:626–38.
452. Meijer A, Lackenby A, Hungnes O, et al. Oseltamivir-resistant influenza virus A (H1N1), Europe, 2007–08 Season. Emerg Infect Dis 2009;15:552–60.
453. World Health Organization. Viruses resistant to oseltamivir (Tamiflu) identified. Geneva, Switzerland: World Health Organization; 2009. Available at: http://www.who.int/csr/disease/swineflu/notes/h1n1_antiviral_resistance_20090708/en/index.html.
454. CDC. Interim guidance on antiviral recommendations for patients with novel influenza A (H1N1) virus infection and their close contacts. Atlanta, GA: US Department of Health and Human Services, CDC; 2009. Available at http://www.cdc.gov/h1n1flu/recommendations.htm.
455. Harper SA, Bradley JS, Englund JA, et al. Seasonal influenza in adults and children-diagnosis, treatment, chemoprophylaxis, and institutional outbreak management: clinical practice guidelines of the Infectious Diseases Society of America. Clin Infect Dis 2009;48:1003–32.

Advisory Committee on Immunization Practices
Membership List, February 2009

Chair: Dale Morse, MD, New York State Department of Health, Albany, New York.

Executive Secretary: Larry Pickering, MD, National Center for Immunization and Respiratory Diseases, CDC, Atlanta, Georgia.

Members: Carol Baker, MD Baylor College of Medicine, Houston, Texas; Robert Beck, JD, Consumer Representative, Palmyra, Virginia; Lance Chilton, MD, University of New Mexico, Albuquerque, New Mexico; Paul Cieslak, MD, Oregon Public Health Division, Portland, Oregon; Kristen Ehresmann, RN, St. Paul, MN; Janet Englund, MD, University of Washington and Children's Hospital and Regional Medical Center, Seattle, Washington; Franklyn Judson, MD, Denver, Colorado; Susan Lett, MD, Massachusetts Department of Public Health, Boston, Massachusetts; Michael Marcy, MD, Torrance, California; Cody Meissner, MD, Boston, MA; Kathleen Neuzil, MD University of Washington; Seattle, Washington; Mark Sawyer, MD, San Diego, California; Ciro Valent Sumaya, MD, Texas A&M University System Health Science Center, Bryan-College Station, Texas; Jonathan Temte, MD, Madison, WI.

Ex-Officio Members: James E. Cheek, MD, Indian Health Service, Albuquerque, New Mexico; Wayne Hachey, DO, Department of Defense, Falls Church, Virginia; Geoffrey S. Evans, MD, Health Resources and Services Administration, Rockville, Maryland; Bruce Gellin, MD, National Vaccine Program Office, Washington, District of Columbia; Linda Murphy, Centers for Medicare and Medicaid Services, Baltimore, Maryland; George T. Curlin, MD, National Institutes of Health, Bethesda, Maryland; Norman Baylor, MD, Food and Drug Administration, Bethesda, Maryland; Linda Kinsinger, MD, Department of Veterans Affairs, Durham, NC.

Liaison Representatives: American Academy of Family Physicians, Doug Campos-Outcalt, MD, Phoenix, Arizona; American Academy of Pediatrics, Joseph Bocchini, MD, Shreveport, Louisiana, David Kimberlin, MD, Birmingham, Alabama; Keith Powell, MD; American Association of Health Plans, Andrea Gelzer, MD, Hartford, Connecticut; American College Health Association, James C. Turner, MD, Charlottesville, Virginia; American College of Obstetricians and Gynecologists, Stanley Gall, MD, Louisville, Kentucky; American College of Physicians, Gregory Poland, Rochester, Minnesota; American Medical Association, Litjen Tan, PhD, Chicago, Illinois; American Osteopathic Association, Stanley Grogg, DO, Tulsa, Oklahoma; American Pharmacists Association, Stephan L. Foster, PharmD, Memphis, Tennessee; America's Health Insurance Plans, Tamara Lewis, MD, Salt Lake City, Utah; Association of Teachers of Preventive Medicine, W. Paul McKinney, MD, Louisville, Kentucky; Biotechnology Industry Organization, Clement Lewin, PhD, Cambridge, Massachusetts; Canadian National Advisory Committee on Immunization, Monica Naus, MD, Vancouver, British Columbia; Healthcare Infection Control Practices Advisory Committee, Steve Gordon, MD, Cleveland, Ohio; Infectious Diseases Society of America, Samuel L. Katz, MD, Durham, North Carolina, London Department of Health, David M. Salisbury, MD, London, United Kingdom; National Association of County and City Health Officials, Nancy Bennett, MD, Rochester, New York, Jeff Duchin, MD, Seattle, Washington; National Coalition for Adult Immunization, David A. Neumann, PhD, Bethesda, Maryland; National Foundation for Infectious Diseases, William Schaffner, MD, Nashville, Tennessee; National Immunization Council and Child Health Program, Mexico, Vesta Richardson, MD, Mexico City, Mexico; National Medical Association, Patricia Whitley-Williams, MD, New Brunswick, New Jersey; National Vaccine Advisory Committee, Gary Freed, MD, Ann Arbor, Michigan; Pharmaceutical Research and Manufacturers of America, Damian A. Braga, Swiftwater, Pennsylvania, Peter Paradiso, PhD, Collegeville, Pennsylvania; Society for Adolescent Medicine, Amy Middleman, MD, Houston, Texas; Society for Health-Care Epidemiology of America, Harry Keyserling, MD, Atlanta, Georgia.

ACIP Influenza Working Group

Chair: Kathleen Neuzil, MD, Seattle, Washington.

Members: Nancy Bennett, MD, Rochester, New York; Henry Bernstein, DO, Lebanon, New Hampshire; Joseph Bresee, MD, Atlanta, Georgia; Carolyn Bridges, MD, Atlanta, Georgia; Karen Broder, MD, Atlanta, Georgia; Doug Campos-Outcalt, MD, Phoenix, Arizona; Lance Chilton, MD, Albuquerque, New Mexico; David Cho, MD Rockville, MD; Nancy Cox, PhD, Atlanta, Georgia; Therese Cvetkovich, MD, Rockville, Maryland; David Delozier, MD, Atlanta, Georgia; Jeff Duchin, MD, Seattle, Washington; Janet Englund, MD, Seattle, Washington; Anthony Fiore, MD, Atlanta, Georgia; Stanley Gall, MD, Louisville, Kentucky; Paul Gargiullo, PhD, Atlanta, Georgia; Steven Gordon, MD, Cleveland, Ohio; Penina Haber, PhD, Atlanta, Georgia; Wayne Hachey, DO, Falls Church, Virginia; Elyse Olshen Kharbanda, MD, New York, NY; Susan Lett, MD, Boston, Massachusetts; Tamara Lewis, MD, Salt Lake City, Utah; Cynthia Nolletti, MD, Rockville, MD; Jeanne Santoli, MD, Atlanta, Georgia; William Schaffner, MD, Nashville, Tennessee; Robert Schechter, MD, Sacramento, California; Kenneth Schmader, MD, Durham, NC; David Shay, MD, Atlanta, Georgia; Danuta Skowronski, MD, Vancouver, British Columbia, Canada; Patricia Stinchfield, St. Paul, Minnesota; Ray Strikas, MD, Washington, District of Columbia; Litjen Tan, PhD, Chicago, Illinois; Mary Vernon-Smiley, MD Atlanta, Georgia; Pascale Wortley, MD, Atlanta, Georgia; Timothy Uyeki, MD, Atlanta, Georgia; Amanda Zongrone, Atlanta, Georgia.

MMWR

The *Morbidity and Mortality Weekly Report (MMWR)* Series is prepared by the Centers for Disease Control and Prevention (CDC) and is available free of charge in electronic format. To receive an electronic copy each week, visit *MMWR*'s free subscription page at *http://www.cdc.gov/mmwr/mmwrsubscribe.html*. Electronic copy also is available from CDC's Internet server at *http://www.cdc.gov/mmwr* or from CDC's file transfer protocol server at *ftp://ftp.cdc.gov/pub/publications/mmwr*. Paper copy subscriptions are available through the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402; telephone 202-512-1800.

Data in the weekly *MMWR* are provisional, based on weekly reports to CDC by state health departments. The reporting week concludes at close of business on Friday; compiled data on a national basis are officially released to the public on the following Friday. Data are compiled in the National Center for Public Health Informatics, Division of Integrated Surveillance Systems and Services. Address all inquiries about the *MMWR* Series, including material to be considered for publication, to Editor, *MMWR* Series, Mailstop E-90, CDC, 1600 Clifton Rd., N.E., Atlanta, GA 30333 or to *mmwrq@cdc.gov*.

☆U.S. Government Printing Office: 2009-523-019/41190 Region IV ISSN: 1057-5987

Appendix F: Using Antiviral Agents for Seasonal Influenza

Summary

1. Annual vaccination is the primary strategy for preventing complications of influenza virus infections.
2. Antiviral medications with activity against influenza viruses are useful adjuncts in the prevention of influenza, and effective *when used early* in the course of illness for treatment.
3. Four influenza antiviral agents are licensed in the United States: amantadine, rimantadine, zanamivir, and oseltamivir.
4. As of July 2, 2009, with few exceptions, novel influenza A (H1N1) viruses that began circulating in April 2009 remained sensitive to oseltamivir.
5. Oseltamivir resistance among circulating seasonal influenza A (H1N1) virus strains presents challenges for the selection of antiviral medications for treatment and chemoprophylaxis of influenza, and provides additional reasons for clinicians to test patients for influenza virus infection and to consult surveillance data when evaluating persons with acute respiratory illnesses during influenza season.
6. CDC has published interim guidelines to provide options for treatment or chemoprophylaxis of influenza in the United States if oseltamivir-resistant seasonal influenza A (H1N1) viruses are circulating widely in a community or if the prevalence of oseltamivir-resistant influenza A (H1N1) viruses is uncertain (see advisory below).

CDC Health Advisory

CDC Issues Interim Recommendations for the Use of Influenza Antiviral Medications in the Setting of Oseltamivir Resistance among Circulating Influenza A (H1N1) Viruses, 2008–2009 Influenza Season

Distributed via Health Alert Network
Friday, December 19, 2008,
11:50 EST (11:50 AM EST)
CDCHAN-00279-2008-12-19-ADV-N

Although influenza activity is low in the United States to date, preliminary data from a limited number of states indicate that the prevalence of influenza A (H1N1) virus strains resistant to the antiviral medication oseltamivir is high. Therefore, CDC is issuing interim recommendations for antiviral treatment and chemoprophylaxis of influenza during the 2008–2009 influenza season. When influenza A (H1N1) virus infection or exposure is suspected, zanamivir or a combination of oseltamivir and rimantadine are more appropriate options than oseltamivir alone. Local influenza surveillance data and laboratory testing can help with physician decision-making regarding the choice of antiviral agents for their patients. The 2008–2009 influenza vaccine is expected to be effective in preventing or reducing the severity of illness with currently circulating influenza viruses, including oseltamivir-resistant influenza A (H1N1) virus strains. Since influenza activity remains low and is expected to increase in the weeks and months to come, CDC recommends that influenza vaccination efforts continue.

Updated guidance on antiviral use will be available from ACIP before the start of the 2009–2010 influenza season. This guidance will include a summary of antiviral resistance data from the 2008–2009 influenza season, and will be published separately from the vaccination recommendations.

Source: Prevention and Control of Seasonal Influenza with Vaccines: Recommendations of the Advisory Committee on Immunization Practices (ACIP), 2009 July 31. Vol. 58 / No. RR-8; 1-52. Available at http://www.cdc.gov/mmwr/preview/mmwrhtml/rr5808a1.htm

Background

Influenza A viruses, including two subtypes (H1N1) and (H3N2), and influenza B viruses, currently circulate worldwide, but the prevalence of each can vary among communities and within a single community over the course of an influenza season. In the United States, four prescription antiviral medications (oseltamivir, zanamivir, amantadine and rimantadine) are approved for treatment and chemoprophylaxis of influenza. Since January 2006, the neuraminidase inhibitors (oseltamivir, zanamivir) have been the only recommended influenza antiviral drugs because of widespread resistance to the adamantanes (amantadine, rimantadine) among influenza A (H3N2) virus strains. The neuraminidase inhibitors have activity against influenza A and B viruses while the adamantanes have activity only against influenza A viruses. In 2007–08, a significant increase in the prevalence of oseltamivir resistance was reported among influenza A (H1N1) viruses worldwide. During the 2007–08 influenza season, 10.9% of H1N1 viruses tested in the U.S. were resistant to oseltamivir.

Influenza activity has been low thus far this season in the United States. As of December 19, 2008, a limited number of influenza viruses isolated in the U.S. since October 1 have been available for antiviral resistance testing at CDC. Of the 50 H1N1 viruses tested to date from 12 states, 98% were resistant to oseltamivir, and all were susceptible to zanamivir, amantadine and rimantadine. Preliminary data indicate that oseltamivir-resistant influenza A (H1N1) viruses do not cause different or more severe symptoms compared to oseltamivir sensitive influenza A (H1N1) viruses. Influenza A (H3N2) and B viruses remain susceptible to oseltamivir. The proportion of influenza A (H1N1) viruses among all influenza A and B viruses that will circulate during the 2008–2009 season cannot be predicted, and will likely vary over the course of the season and among communities. Oseltamivir-resistant influenza A (H1N1) viruses are antigenically similar to the influenza A (H1N1) virus strain represented in 2008–2009 influenza vaccine, and CDC recommends that influenza vaccination efforts continue as the primary method to prevent influenza.

Oseltamivir resistance among circulating influenza A (H1N1) virus strains presents challenges for the selection of antiviral medications for treatment and chemoprophylaxis of influenza, and provides additional reasons for clinicians to test patients for influenza virus infection and to consult surveillance data when evaluating persons with acute respiratory illnesses during influenza season. These interim guidelines provide options for treatment or chemoprophylaxis of influenza in the United States if oseltamivir-resistant H1N1 viruses are circulating widely in a community or if the prevalence of oseltamivir resistant H1N1 viruses is uncertain.

Interim Recommendations

Persons providing medical care for patients with suspected influenza or persons who are candidates for chemoprophylaxis against influenza should consider the following guidance for assessing and treating patients during the 2008–2009 influenza season (see Table on following page). Guidance Table:

1. Review local or state influenza virus surveillance data weekly during influenza season, to determine which types (A or B) and subtypes of influenza A virus (H3N2 or H1N1) are currently circulating in the area. For some communities, surveillance data might not be available or timely enough to provide information useful to clinicians.

TABLE: Interim recommendations for the selection of antiviral treatment using laboratory test results and viral surveillance data, United States, 2008–2009 season‡

Rapid antigen or other laboratory test	Predominant virus(es) in community	Preferred medication(s)	Alternative (combination antiviral treatment)
Not done or negative, but clinical suspicion for influenza	H1N1 or unknown	Zanamivir	Oseltamivir + Rimantadine*
Not done or negative, but clinical suspicion for influenza	H3N2 or B	Oseltamivir or Zanamivir	None
Positive A	H1N1 or unknown	Zanamivir	Oseltamivir + Rimantadine*
Positive A	H3N2 or B	Oseltamivir or Zanamivir	None
Positive B	Any	Oseltamivir or Zanamivir	None
Positive A+B**	H1N1 or unknown	Zanamivir	Oseltamivir + Rimantadine*
Positive A+B**	H3N2 or B	Oseltamivir or Zanamivir	None

‡ Influenza antiviral medications used for treatment are most beneficial when initiated within the first two days of illness. Clinicians should consult the package insert of each antiviral medication for specific dosing information, approved indications and ages, contraindications/warnings/precautions, and adverse effects.

*Amantadine can be substituted for rimantadine but has increased risk of adverse events. Human data are lacking to support the benefits of combination antiviral treatment of influenza; however, these interim recommendations are intended to assist clinicians treating patients who might be infected with oseltamivir-resistant influenza A (H1N1) virus.

** Positive A+B indicates a rapid antigen test that cannot distinguish between influenza and influenza B viruses

2. Consider use of influenza tests that can distinguish influenza A from influenza B.
   - Patients testing positive for influenza B may be given either oseltamivir or zanamivir (no preference) if treatment is indicated.
   - At this time, if a patient tests positive for influenza A, use of zanamivir should be considered if treatment is indicated. Oseltamivir should be used alone only if recent local surveillance data indicate that circulating viruses are likely to be influenza A (H3N2) or influenza B viruses. Combination treatment with oseltamivir and rimantadine is an acceptable alternative, and might be necessary for patients that cannot receive zanamivir, (e.g., patient is <7 years old, has chronic underlying airways disease, or cannot use the zanamivir inhalation device), or zanamivir is unavailable. Amantadine can be substituted for rimantadine if rimantadine is unavailable.
   - If a patient tests negative for influenza, consider treatment options based on local influenza activity and clinical impression of the likelihood of influenza. Because rapid antigen tests may have low sensitivity, treatment should still be considered during periods of high

influenza activity for persons with respiratory symptoms consistent with influenza who test negative and have no alternative diagnosis. Use of zanamivir should be considered if treatment is indicated. Combination treatment with oseltamivir and rimantadine (substitute amantadine if rimantadine unavailable) is an acceptable alternative. Oseltamivir should be used alone only if recent local surveillance data indicates that circulating viruses are likely to be influenza A(H3N2) or influenza B viruses.

- If available, confirmatory testing with a diagnostic test capable of distinguishing influenza caused by influenza A (H1N1) virus from influenza caused by influenza A (H3N2) or influenza B virus can also be used to guide treatment. When treatment is indicated, influenza A (H3N2) and influenza B virus infections should be treated with oseltamivir or zanamivir (no preference). Influenza A (H1N1) virus infections should be treated with zanamivir or combination treatment with oseltamivir and rimantadine is an acceptable alternative.

3. Persons who are candidates for chemoprophylaxis (e.g., residents in an assisted living facility during an influenza outbreak, or persons who are at higher risk for influenza-related complications and have had recent household or other close contact with a person with laboratory confirmed influenza) should be provided with medications most likely to be effective against the influenza virus that is the cause of the outbreak, if known. Respiratory specimens from ill persons during institutional outbreaks should be obtained and sent for testing to determine the type and subtype of influenza A viruses associated with the outbreak and to guide antiviral therapy decisions. Persons whose need for chemoprophylaxis is due to potential exposure to a person with laboratory-confirmed influenza A (H3N2) or influenza B should receive oseltamivir or zanamivir (no preference). Zanamivir should be used when persons require chemoprophylaxis due to exposure to influenza A (H1N1) virus. Rimantadine can be used if zanamivir use is contraindicated.

Enhanced surveillance for influenza antiviral resistance is ongoing at CDC in collaboration with local and state health departments. Clinicians should remain alert for additional changes in recommendations that might occur as the 2008–2009 influenza season progresses. Oseltamivir resistant influenza A (H1N1) viruses are antigenically similar to the influenza A(H1N1) viruses represented in the vaccine, and vaccination should continue to be considered the primary prevention strategy regardless of oseltamivir sensitivity. Information on antiviral resistance will be updated in weekly surveillance reports (available at http://www.cdc.gov/flu/weekly/fluactivity.htm).

For more information on antiviral medications and additional considerations related to antiviral use during the 2008–2009 influenza season, visit http://www.cdc.gov/flu/professionals/antivirals/index.htm.

This Message was distributed to State and Local Health Officers, Public Information Officers, Epidemiologists, State Laboratory Directors, PHEP/BT Coordinators and HAN Coordinators, as well as Public Health Associations and Clinician organizations.

Appendix G: Vaccine Management: Recommendations for Storage and Handling of Selected Biologicals—(November 2007)

Vaccine Management: Recommendations for Storage and Handling of Selected Biologicals—November 2007

Source: Centers for Disease Control and Prevention (CDC). November 2007. Found at: http://www.cdc.gov/vaccines/pubs/downloads/bk-vac-mgt.pdf

The Vaccine Management: Recommendations for Storage and Handling of Selected Biologicals guide provides shipping requirements; condition upon arrival; storage requirements; shelf life; instructions for reconstitution and use; shelf life after reconstitution, thawing and opening; and any special instructions for all recommended vaccines.

VACCINE MANAGEMENT

Recommendations for Storage and Handling of Selected Biologicals

November 2007

DEPARTMENT OF HEALTH AND HUMAN SERVICES
CENTERS FOR DISEASE CONTROL AND PREVENTION

CDC
SAFER · HEALTHIER · PEOPLE™

CS113788

Contents

DT: Diphtheria, Tetanus Toxoids—Pediatric
Td: Tetanus, Diphtheria Toxoids—Adult

Shipping Requirements

Should be shipped in insulated container. Maintain temperature at 35° – 46°F (2° – 8°C). **Do not freeze or expose to freezing temperatures.**

Condition upon Arrival

Should not have been frozen or exposed to freezing temperatures. Refrigerate upon arrival.

If you have questions about the condition of the material at the time of delivery, you should 1) immediately place material in recommended storage; and 2) then follow your state health department immunization program policy and contact either the Manufacturer's Quality Control office or the immunization program for guidance.

Storage Requirements

Refrigerate immediately upon arrival. Store at 35° – 46°F (2° – 8°C). **Do not freeze or expose to freezing temperatures.**

Shelf Life

Check expiration date on vial or manufacturer-filled syringe.

Instructions for Use

Inspect visually for extraneous particulate matter and/or discoloration. If these conditions exist, the vaccine should not be used. Shake vial or manufacturer-filled syringe well before use. Discard vaccine if it cannot be resuspended with thorough agitation.

Shelf Life after Opening

Single-Dose Vials: The vaccine should be administered shortly after withdrawal from the vial.

Multidose Vials: Withdraw single dose of vaccine into separate sterile needle and syringe for each immunization. The vaccine should be administered shortly after withdrawal from the vial. Unused portions of multidose vials may be refrigerated at 35° – 46°F (2° – 8°C) and used until expired, if not contaminated or unless otherwise stated in the manufacturer's product information.

Manufacturer-Filled Syringes: The vaccine should be administered shortly after the needle is attached to the syringe.

Special Instructions

Rotate stock so that the earliest dated material is used first.

Note: All vaccine materials should be disposed of using medical waste disposal procedures. Contact the state health department for details.

DTaP: Diphtheria Toxoid, Tetanus Toxoid, Acellular Pertussis Vaccine—Pediatric

DTaP/Hib: Diphtheria Toxoid, Tetanus Toxoid, Acellular Pertussis Vaccine Combined with *Haemophilus influenzae* type b Conjugate Vaccine*—Pediatric

DTaP/HepB/IPV: Diphtheria Toxoid, Tetanus Toxoid, Acellular Pertussis Vaccine, Hepatitis B Vaccine, Inactivated Polio Vaccine—Pediatric

Tdap: Tetanus Toxoid, Diphtheria Toxoid, Acellular Pertussis Vaccine—Adult

Shipping Requirements

Should be shipped in insulated container. Maintain temperature at 35° – 46°F (2° – 8°C). **Do not freeze or expose to freezing temperatures.**

Condition upon Arrival

Should not have been frozen or exposed to freezing temperatures. Refrigerate upon arrival.

If you have questions about the condition of the material at the time of delivery, you should 1) immediately place material in recommended storage; and 2) then follow your state health department immunization program policy and contact either the Manufacturer's Quality Control office or the immunization program for guidance.

Storage Requirements

Refrigerate immediately upon arrival. Store at 35° – 46°F (2° – 8°C). **Do not freeze or expose to freezing temperatures.**

Shelf Life

Check expiration date on vial, or manufacturer-filled syringe.

Instructions for Reconstitution* or Use

Inspect visually for extraneous particulate matter and/or discoloration. If these conditions exist, the vaccine should not be used. Shake vial or manufacturer-filled syringe well before use. Discard vaccine if it cannot be resuspended with thorough agitation.

Shelf Life after Reconstitution* or Opening

Single-Dose Vials: The vaccine should be administered shortly after withdrawal from the vial.

Manufacturer-Filled Syringes: The vaccine should be administered shortly after the needle is attached to the syringe.

Special Instructions

Rotate stock so that the earliest dated material is used first.

Note: All vaccine materials should be disposed of using medical waste disposal procedures. Contact the state health department for details.

* DTaP/Hib (TriHIBit®) is ActHIB® (sanofi pasteur) reconstituted with Tripedia® (sanofi pasteur). Once reconstituted, this combination vaccine must be used within 30 minutes or discarded. The only DTaP vaccine that can be used to reconstitute ActHIB® is Tripedia®. No other brand of DTaP is approved for this use.

Hepatitis Vaccines: Hepatitis A, Hepatitis B, Hepatitis A/B, Hepatitis B/*Haemophilus influenzae* type b

Shipping Requirements

Should be shipped in insulated container. Maintain temperature at 35° – 46°F (2° – 8°C). **Do not freeze or expose to freezing temperatures.**

Condition upon Arrival

Should not have been frozen or exposed to freezing temperatures. Refrigerate upon arrival.

If you have questions about the condition of the material at the time of delivery, you should 1) immediately place material in recommended storage; and 2) then follow your state health department immunization program policy and contact either the Manufacturer's Quality Control office or the immunization program for guidance.

Storage Requirements

Refrigerate immediately upon arrival. Store at 35° – 46°F (2° – 8°C). **Do not freeze or expose to freezing temperatures.**

Shelf Life

Check expiration date on vial or manufacturer-filled syringe.

Instructions for Use

Inspect visually for extraneous particulate matter and/or discoloration. If these conditions exist, the vaccine should not be used. Shake vial or manufacturer-filled syringe well before use. Discard vaccine if it cannot be resuspended with thorough agitation.

Shelf Life after Opening

Single-Dose Vials: The vaccine should be administered shortly after withdrawal from the vial.

Manufacturer-Filled Syringes: The vaccine should be administered shortly after the needle is attached to the syringe.

Special Instructions

Rotate stock so that the earliest dated material is used first.

Note: All vaccine materials should be disposed of using medical waste disposal procedures. Contact the state health department for details.

Hib: *Haemophilus influenzae* type b Conjugate Vaccine

Shipping Requirements

Should be shipped in insulated container. Maintain temperature at 35° – 46°F (2° – 8°C). **Do not freeze or expose to freezing temperatures.**

Condition upon Arrival

Should not have been frozen or exposed to freezing temperatures. Refrigerate upon arrival.

If you have questions about the condition of the material at the time of delivery, you should 1) immediately place material in recommended storage; and 2) then follow your state health department immunization program policy and contact either the Manufacturer's Quality Control office or the immunization program for guidance.

Storage Requirements

Vaccine: Refrigerate immediately upon arrival. Store at 35° – 46°F (2° – 8°C). **Do not freeze or expose to freezing temperatures.**

Diluent: May be refrigerated or stored at room temperature (68° – 77°F [20° – 25°C]). **Do not freeze or expose to freezing temperatures.**

Shelf Life

Check expiration date on vial.

Instructions for Reconstitution* or Use

Inspect visually for extraneous particulate matter and/or discoloration. If these conditions exist, the vaccine should not be used. Shake vial well before use. Discard vaccine if it cannot be resuspended with thorough agitation.

Shelf Life after Reconstitution* or Opening

Single-Dose Vials: The vaccine should be administered shortly after withdrawal from the vial.

Special Instructions

Rotate stock so that the earliest dated material is used first.

Note: All vaccine materials should be disposed of using medical waste disposal procedures. Contact the state health department for details.

* ActHIB® (sanofi pasteur) reconstituted with 0.4% sodium chloride diluent should be used within 24 hours after reconstitution. If sanofi pasteur DTaP-Tripedia® is used to reconstitute ActHIB®, the TriHibit® vaccine must be used within 30 minutes of reconstitution. Only sanofi pasteur DTaP-Tripedia® or the diluent shipped with the product may be used to reconstitute the sanofi pasteur ActHIB® product. No other brand of DTaP is licensed for use in reconstitution of ActHIB®.

HPV: Human Papillomavirus Vaccine

Shipping Requirements

Should be shipped in insulated container. Maintain temperature at 35° – 46°F (2° – 8°C). **Do not freeze or expose to freezing temperatures.**

Condition upon Arrival

Should not have been frozen or exposed to freezing temperatures. Refrigerate upon arrival.

If you have questions about the condition of the material at the time of delivery, you should 1) immediately place material in recommended storage; and 2) then follow your state health department immunization program policy and contact either the Manufacturer's Quality Control office or the immunization program for guidance.

Storage Requirements

Refrigerate immediately upon arrival. Store at 35° – 46°F (2° – 8°C). **Do not freeze or expose to freezing temperatures.** Protect from light at all times.

Shelf Life

Check expiration date on vial or manufacturer-filled syringe.

Instructions for Use

Inspect visually for extraneous particulate matter and/or discoloration. If these conditions exist, the vaccine should not be used. Shake vial or manufacturer-filled syringe well before use. Discard vaccine if it cannot be resuspended with thorough agitation.

Shelf Life after Opening

Single-Dose Vials: The vaccine should be administered shortly after withdrawal from the vial.

Manufacturer-Filled Syringes: The vaccine should be administered shortly after the needle is attached to the syringe.

Special Instructions

Rotate stock so that the earliest dated material is used first.

Note: All vaccine materials should be disposed of using medical waste disposal procedures. Contact the state health department for details.

IPV: Inactivated Polio Vaccine

Shipping Requirements

Should be shipped in insulated container. Maintain temperature at 35° – 46°F (2° – 8°C). **Do not freeze or expose to freezing temperatures.**

Condition upon Arrival

Should not have been frozen or exposed to freezing temperatures. Refrigerate upon arrival.

If you have questions about the condition of the material at the time of delivery, you should 1) immediately place material in recommended storage; and 2) then follow your state health department immunization program policy and contact either the Manufacturer's Quality Control office or the immunization program for guidance.

Storage Requirements

Refrigerate immediately upon arrival. Store at 35° – 46°F (2° – 8°C). **Do not freeze or expose to freezing temperatures.**

Shelf Life

Check expiration date on vial or manufacturer-filled syringe.

Instructions for Use

Inspect visually for extraneous particulate matter and/or discoloration. If these conditions exist, the vaccine should not be used. Shake vial or manufacturer-filled syringe well before use. Discard vaccine if it cannot be resuspended with thorough agitation.

Shelf Life after Opening

Multidose Vials: Withdraw single dose of vaccine into separate sterile needle and syringe for each immunization. The vaccine should be administered shortly after withdrawal from the vial. Unused portions of multidose vials may be refrigerated at 35° – 46°F (2° – 8°C) and used until expired, if not contaminated or unless otherwise stated in the manufacturer's product information.

Manufacturer-Filled Syringes: The vaccine should be administered shortly after the needle is attached to the syringe.

Special Instructions

Rotate stock so that the earliest dated material is used first.

Note: All vaccine materials should be disposed of using medical waste disposal procedures. Contact the state health department for details.

TIV: Trivalent Inactivated Influenza Vaccine

Shipping Requirements

Should be shipped in insulated container. Maintain temperature at 35° – 46°F (2° – 8°C). **Do not freeze or expose to freezing temperatures.**

Condition upon Arrival

Should not have been frozen or exposed to freezing temperatures. Refrigerate upon arrival.

If you have questions about the condition of the material at the time of delivery, you should 1) immediately place material in recommended storage; and 2) then follow your state health department immunization program policy and contact either the Manufacturer's Quality Control office or the immunization program for guidance.

Storage Requirements

Refrigerate immediately upon arrival. Store at 35° – 46°F (2° – 8°C). **Do not freeze or expose to freezing temperatures.** Protect Fluarix® and FluLaval™ from light at all times by storing in original package.

Shelf Life

Formulated for use during current influenza season. Check expiration date on vial or manufacturer-filled syringe.

Instructions for Use

Inspect visually for extraneous particulate matter and/or discoloration. If these conditions exist, the vaccine should not be used. Shake vial or manufacturer-filled syringe well before use. Discard vaccine if it cannot be resuspended with thorough agitation.

Shelf Life after Opening

Single-Dose Vials: The vaccine should be administered shortly after withdrawal from the vial.

Multidose Vials: Withdraw single dose of vaccine into separate sterile needle and syringe for each immunization. The vaccine should be administered shortly after withdrawal from the vial. Unused portions of multidose vials may be refrigerated at 35° – 46°F (2° – 8°C) and used until expired, if not contaminated or unless otherwise stated in the manufacturer's product information.

Manufacturer-Filled Syringes: The vaccine should be administered shortly after the needle is attached to the syringe.

Special Instructions

Rotate stock so that the earliest dated material is used first.

Note: All vaccine materials should be disposed of using medical waste disposal procedures. Contact the state health department for details.

LAIV: Live Attenuated Influenza Vaccine

Shipping Requirements

Initially shipped to authorized distributors in the frozen state 5°F (-15°C). Shipped from the distributor to healthcare facilities in the refrigerated state at 35° – 46°F (2° – 8°C).

Condition upon Arrival

Refrigerate upon arrival.

If you have questions about the condition of the material at the time of delivery, you should 1) immediately place material in recommended storage; and 2) then follow your state health department immunization program policy and contact either the Manufacturer's Quality Control office or the immunization program for guidance.

Storage Requirements

Refrigerate immediately upon arrival. Store at 35° – 46°F (2° – 8°C). **Do not freeze or expose to freezing temperatures.** (If LAIV is inadvertently frozen, the vaccine should be moved immediately to the refrigerator and may be used until the expiration date printed on the package.)

Shelf Life

Formulated for use during current influenza season. Check expiration date on package.

Instructions for Use

LAIV is a colorless to pale yellow liquid and is clear to slightly cloudy; some particulates may be present but do not affect the use of the product. After removal of the sprayer from the refrigerator, remove the rubber tip protector. Follow manufacturer's instructions to deliver ½ dose into one nostril. Then remove the dose-divider clip and deliver the remainder of the dose into the other nostril.

Shelf Life after Opening

Single-Dose Sprayer: The vaccine should be administered shortly after removal from the refrigerator.

Special Instructions

Rotate stock so that the earliest dated material is used first.

Note: All vaccine materials should be disposed of using medical waste disposal procedures. Contact the state health department for details.

MMR: Measles/Mumps/Rubella Vaccine, MR: Measles/Rubella Vaccine, Measles Virus Vaccine, Mumps Virus Vaccine, Rubella Virus Vaccine

Shipping Requirements

Vaccine: Should be shipped in insulated container. Must be shipped with refrigerant. Maintain temperature at 50°F (10°C) or less. If shipped with dry ice, diluent must be shipped separately.

Diluent: May be shipped with vaccine, but do not place in container with dry ice.

Condition upon Arrival

Maintain at 50°F (10° C) or less. **Do not use warm vaccine.** Refrigerate upon arrival.

If you have questions about the condition of the material at the time of delivery, you should 1) immediately place material in recommended storage; and 2) then follow your state health department immunization program policy and contact either the Manufacturer's Quality Control office or the immunization program for guidance.

Storage Requirements

Vaccine: Refrigerate immediately upon arrival. Store at 35° – 46°F (2° – 8°C). Protect from light at all times, since such exposure may inactivate the vaccine viruses.

Diluent: May be refrigerated or stored at room temperature (68° – 77°F [20° – 25°C]). **Do not freeze or expose to freezing temperatures.**

Note: MMR vaccine may be stored in the refrigerator or freezer.

Shelf Life

Check expiration date on vial.

Instructions for Reconstitution and Use

Reconstitute just before use according to the manufacturer's instructions. Use only the diluent supplied to reconstitute the vaccine.

Shelf Life after Reconstitution, Thawing or Opening

Single-Dose Vials: After reconstitution, use immediately or store at 35° – 46°F (2° – 8°C) and protect from light. **Discard if not used within 8 hours of reconstitution.**

Multidose vials: Withdraw single dose of reconstituted vaccine into separate sterile needle and syringe for each immunization. The vaccine dose should be administered shortly after withdrawal from vial. Unused portions of multidose vials may be refrigerated at 35° – 46°F (2° – 8°C), but must be discarded if not used within 8 hours after reconstitution.

Special Instructions

Rotate stock so that the earliest dated material is used first.

Note: All vaccine materials should be disposed of using medical waste disposal procedures. Contact the state health department for details.

MMRV: Measles/Mumps/Rubella/Varicella Vaccine

Shipping Requirements

Vaccine: Should be shipped in insulated container. Must be shipped with dry ice only, at 5°F (-15°C) or colder. Should be delivered within 2 days.

Diluent: May be shipped with vaccine, but do not place in container with dry ice.

Condition upon Arrival

Should be frozen. Vaccine should remain at 5°F (-15°C) or colder until arrival at the healthcare facility. Dry ice should still be present in the shipping container when vaccine is delivered.

If you have questions about the condition of the material at the time of delivery, you should 1) immediately place material in recommended storage; and 2) then follow your state health department immunization program policy and contact either the Manufacturer's Quality Control office or the immunization program for guidance.

Storage Requirements

Vaccine: Freeze immediately upon arrival. Maintain vaccine in a continuously frozen state at 5°F (-15°C) or colder. **No freeze/thaw cycles are allowed with this vaccine.** Vaccine should only be stored in freezers or refrigerator/freezers with separate external doors and compartments. Acceptable storage may be achieved in standard household freezers purchased in the last 10 years, and standard household refrigerator/freezers with a separate, sealed freezer compartment. "Dormitory-style units" are not appropriate for the storage of MMRV vaccine. **Do not store lyophilized vaccine in the refrigerator. If lyophilized vaccine is inadvertently stored in the refrigerator, it should be used within 72 hours. Lyophilized vaccine stored at 35° – 46°F (2° – 8°C) which is not used within 72 hours should be discarded.**

Protect the vaccine from light at all times since such exposure may inactivate the vaccine viruses.

In order to maintain temperatures of 5°F (-15°C) or colder, it will be necessary in most refrigerator/freezer models to adjust the temperature dial down to the coldest setting. This may result in the refrigerator compartment temperature being lowered as well. Careful monitoring of the refrigerator temperature will be necessary to avoid freezing killed or inactivated vaccines.

Diluent: May be refrigerated or stored at room temperature (68° – 77°F [20° – 25°C]). **Do not freeze or expose to freezing temperatures.**

Shelf Life

Check expiration date on vial.

Instructions for Reconstitution and Use

Reconstitute just before use according to the manufacturer's instructions. Use only the diluent supplied to reconstitute the vaccine.

Shelf Life after Reconstitution, Thawing or Opening

Single-Dose Vials: Discard reconstituted vaccine if it is not used **within 30 minutes** of reconstitution. **Do not freeze reconstituted vaccine.**

Special Instructions

Rotate stock so that the earliest dated material is used first.

If this vaccine is stored at a temperature warmer than 5°F (-15°C), it will result in a loss of potency and a reduced shelf life. If a power outage or some other situation occurs that results in the vaccine storage temperature rising above the recommended temperature, the healthcare provider should contact Merck, the vaccine manufacturer, at 1-800-MERCK-90 for an evaluation of the product potency before using the vaccine.

Note: All vaccine materials should be disposed of using medical waste disposal procedures. Contact the state health department for details.

MCV: Meningococcal Conjugate Vaccine

Shipping Requirements

Should be shipped in insulated container. Maintain temperature at 35° – 46°F (2° – 8°C). **Do not freeze or expose to freezing temperatures.**

Condition upon Arrival

Should not have been frozen or exposed to freezing temperatures. Refrigerate upon arrival.

If you have questions about the condition of the material at the time of delivery, you should 1) immediately place material in recommended storage; and 2) then follow your state health department immunization program policy and contact either the Manufacturer's Quality Control office or the immunization program for guidance.

Storage Requirements

Refrigerate immediately upon arrival. Store at 35° – 46°F (2° – 8°C). **Do not freeze or expose to freezing temperatures.**

Shelf Life

Check expiration date on vial or manufacturer-filled syringe.

Instructions for Use

Inspect visually for extraneous particulate matter and/or discoloration. If these conditions exist, the vaccine should not be used. Shake vial or manufacturer-filled syringe well before use. Discard vaccine if it cannot be resuspended with thorough agitation.

Shelf Life after Opening

Single-Dose Vials: The vaccine should be administered shortly after withdrawal from the vial.

Manufacturer-Filled Syringes: The vaccine should be administered shortly after the needle is attached to the syringe.

Special Instructions

Rotate stock so that the earliest dated material is used first.

Note: All vaccine materials should be disposed of using medical waste disposal procedures. Contact the state health department for details.

MPSV: Meningococcal Polysaccharide Vaccine

Shipping Requirements

Should be shipped in insulated container. Maintain temperature at 35° – 46°F (2° – 8°C). **Do not freeze or expose to freezing temperatures.**

Condition upon Arrival

Should not have been frozen or exposed to freezing temperatures. Refrigerate upon arrival.

If you have questions about the condition of the material at the time of delivery, you should 1) immediately place material in recommended storage; and 2) then follow your state health department immunization program policy and contact either the Manufacturer's Quality Control office or the immunization program for guidance.

Storage Requirements

Vaccine: Refrigerate immediately upon arrival. Store at 35° – 46°F (2° – 8°C). **Do not freeze or expose to freezing temperatures.**

Diluent: May be refrigerated or stored at room temperature (68° – 77°F [20° – 25°C]). **Do not freeze or expose to freezing temperatures.**

Shelf Life

Check expiration date on vial.

Instructions for Reconstitution and Use

Reconstitute just before using according to the manufacturer's instructions. Use only the diluent supplied to reconstitute the vaccine.

Shelf Life after Reconstitution or Opening

Single-Dose Vials: Use **within 30 minutes** of reconstitution.

Multidose Vials: Unused portions of multidose vials may be refrigerated at 35° – 46°F (2° – 8°C) and used up to 35 days after reconstitution.

Special Instructions

Rotate stock so that the earliest dated material is used first.

Note: All vaccine materials should be disposed of using medical waste disposal procedures. Contact the state health department for details.

PCV: Pneumococcal Conjugate Vaccine

Shipping Requirements

Should be shipped in insulated container. Maintain temperature at 35° – 46°F (2° – 8°C). **Do not freeze or expose to freezing temperatures.**

Condition upon Arrival

Should not have been frozen or exposed to freezing temperatures. Refrigerate upon arrival.

If you have questions about the condition of the material at the time of delivery, you should 1) immediately place material in recommended storage; and 2) then follow your state health department immunization program policy and contact either the Manufacturer's Quality Control office or the immunization program for guidance.

Storage Requirements

Refrigerate immediately upon arrival. Store at 35° – 46°F (2° – 8°C). **Do not freeze or expose to freezing temperatures.**

Shelf Life

Check expiration date on vial or manufacturer-filled syringe.

Instructions for Use

Inspect visually for extraneous particulate matter and/or discoloration. If these conditions exist, the vaccine should not be used. Shake vial or manufacturer-filled syringe well before use. Discard vaccine if it cannot be resuspended with thorough agitation.

Shelf Life after Opening

Single-Dose Vials: The vaccine should be administered shortly after withdrawal from the vial.

Manufacturer-Filled Syringes: The vaccine should be administered shortly after the needle is attached to the syringe.

Special Instructions

Rotate stock so that the earliest dated material is used first.

Note: All vaccine materials should be disposed of using medical waste disposal procedures. Contact the state health department for details.

PPV: Pneumococcal Polysaccharide Vaccine

Shipping Requirements

Should be shipped in insulated container. Maintain temperature at 35° – 46°F (2° – 8°C). **Do not freeze or expose to freezing temperatures.**

Condition upon Arrival

Should not have been frozen or exposed to freezing temperatures. Refrigerate upon arrival.

If you have questions about the condition of the material at the time of delivery, you should 1) immediately place material in recommended storage; and 2) then follow your state health department immunization program policy and contact either the Manufacturer's Quality Control office or the immunization program for guidance.

Storage Requirements

Refrigerate immediately upon arrival. Store at 35° – 46°F (2° – 8°C). **Do not freeze or expose to freezing temperatures.**

Shelf Life

Check expiration date on vial.

Instructions for Use

Inspect visually for extraneous particulate matter and/or discoloration. If these conditions exist, the vaccine should not be used. Shake vial or manufacturer-filled syringe well before use. Discard vaccine if it cannot be resuspended with thorough agitation.

Shelf Life after Opening

Single-Dose Vials: The vaccine should be administered shortly after withdrawal from the vial.

Multidose Vials: Withdraw single dose of vaccine into separate sterile needle and syringe for each immunization. The vaccine should be administered shortly after withdrawal from the vial. Unused portions of multidose vials may be refrigerated at 35° – 46°F (2° – 8°C) and used until expired, if not contaminated or unless otherwise stated in the manufacturer's product information.

Special Instructions

Rotate stock so that the earliest dated material is used first.

Note: All vaccine materials should be disposed of using medical waste disposal procedures. Contact the state health department for details.

Rotavirus Vaccine

Shipping Requirements

Should be shipped in insulated container. Maintain temperature at 35° – 46°F (2° – 8°C). **Do not freeze or expose to freezing temperatures.**

Condition upon Arrival

Should not have been frozen or exposed to freezing temperatures. Refrigerate upon arrival.

If you have questions about the condition of the material at the time of delivery, you should 1) immediately place material in recommended storage; and 2) then follow your state health department immunization program policy and contact either the Manufacturer's Quality Control office or the immunization program for guidance.

Storage Requirements

Refrigerate immediately upon arrival. Store at 35° – 46°F (2° – 8°C). **Do not freeze or expose to freezing temperatures.** Protect from light at all times, since such exposure may inactivate the vaccine viruses.

Shelf Life

Check expiration date on package.

Instructions for Use

Each dose is supplied in a container consisting of a squeezable plastic, latex-free dosing tube with a twist-off cap, allowing for direct oral administration. The dosing tube is contained in a pouch. Remove the dosing tube from the pouch, screw the cap clockwise to puncture the tube, and screw the cap off counter-clockwise so that the liquid can be squeezed from the tube during oral administration of the vaccine.

Shelf Life after Opening

Pouched Single-Dose Tubes: The vaccine should be administered shortly after withdrawal from the refrigerator. The dosing tube should not be returned to the refrigerator once the screw cap has been removed.

Special Instructions

Rotate stock so that the earliest dated material is used first.

Note: All vaccine materials should be disposed of using medical waste disposal procedures. Contact the state health department for details.

Varicella (Chickenpox) Vaccine

Shipping Requirements

Vaccine: Should be shipped in insulated container. Must be shipped with dry ice only, at 5°F (-15°C) or colder. Should be delivered within 2 days.

Diluent: May be shipped with vaccine, but do not place in container with dry ice.

Condition upon Arrival

Should be frozen. Vaccine should remain at 5°F (-15°C) or colder until arrival at the healthcare facility. Dry ice should still be present in the shipping container when vaccine is delivered.

If you have questions about the condition of the material at the time of delivery, you should 1) immediately place material in recommended storage; and 2) then follow your state health department immunization program policy and contact either the Manufacturer's Quality Control office or the immunization program for guidance.

Storage Requirements

Vaccine: Freeze immediately upon arrival. Maintain vaccine in a continuously frozen state at 5°F (-15°C) or colder. **No freeze/thaw cycles are allowed with this vaccine.** Vaccine should only be stored in freezers or refrigerator/freezers with separate external doors and compartments. Acceptable storage may be achieved in standard household freezers purchased in the last 10 years, and standard household refrigerator/freezers with a separate, sealed freezer compartment. "Dormitory-style units" are not appropriate for the storage of varicella vaccine. **Do not store lyophilized vaccine in the refrigerator. If lyophilized vaccine is inadvertently stored in the refrigerator, it should be used within 72 hours. Lyophilized vaccine stored at 35° – 46°F (2° – 8°C) which is not used within 72 hours, should be discarded.**

Protect the vaccine from light at all times since such exposure may inactivate the vaccine virus.

In order to maintain temperatures of 5°F (-15°C) or colder, it will be necessary in most refrigerator/freezer models to turn the temperature dial down to the coldest setting. This may result in the refrigerator compartment temperature being lowered as well. Careful monitoring of the refrigerator temperature will be necessary to avoid freezing killed or inactivated vaccines.

Diluent: May be refrigerated or stored at room temperature (68° – 77°F [20° – 25°C]). **Do not freeze or expose to freezing temperatures.**

Shelf Life

Check expiration date on vial.

Instructions for Reconstitution and Use

Reconstitute just before use according to the manufacturer's instructions. Use only the diluent supplied to reconstitute the vaccine.

Shelf Life after Reconstitution, Thawing or Opening

Single-Dose Vials: Discard reconstituted vaccine if it is not used **within 30 minutes** of reconstitution. **Do not freeze reconstituted vaccine.**

Special Instructions

Rotate stock so that the earliest dated material is used first.

If this vaccine is stored at a temperature warmer than 5°F (-15°C), it will result in a loss of potency and a reduced shelf life. If a power outage or some other situation occurs that results in the vaccine storage temperature rising above the recommended temperature, the healthcare provider should contact Merck, the vaccine manufacturer, at 1-800-9-VARIVAX for an evaluation of the product potency before using the vaccine.

Note: All vaccine materials should be disposed of using medical waste disposal procedures. Contact the state health department for details.

Zoster (Shingles) Vaccine

Shipping Requirements

Vaccine: Should be shipped in insulated container. Must be shipped with dry ice only, at 5°F (-15°C) or colder. Should be delivered within 2 days.

Diluent: May be shipped with vaccine, but do not place in container with dry ice.

Condition upon Arrival

Should be frozen. Vaccine should remain at 5°F (-15°C) or colder until arrival at the healthcare facility. Dry ice should still be present in the shipping container when vaccine is delivered.

If you have questions about the condition of the material at the time of delivery, you should 1) immediately place material in recommended storage; and 2) then follow your state health department immunization program policy and contact either the Manufacturer's Quality Control office or the immunization program for guidance.

Storage Requirements

Vaccine: Freeze immediately upon arrival. Maintain vaccine in a continuously frozen state at 5°F (-15°C) or colder. **No freeze/thaw cycles are allowed with this vaccine.** Vaccine should only be stored in freezers or refrigerator/freezers with separate external doors and compartments. Acceptable storage may be achieved in standard household freezers purchased in the last 10 years, and standard household refrigerator/freezers with a separate, sealed freezer compartment. "Dormitory-style units" are not appropriate for the storage of zoster vaccine. **Do not store lyophilized vaccine in the refrigerator.** Protect the vaccine from light at all times since such exposure may inactivate the vaccine virus.

In order to maintain temperatures of 5°F (-15°C) or colder, it will be necessary in most refrigerator/freezer models to turn the temperature dial down to the coldest setting. This may result in the refrigerator compartment temperature being lowered as well. Careful monitoring of the refrigerator temperature will be necessary to avoid freezing killed or inactivated vaccines.

Diluent: May be refrigerated or stored at room temperature (68° – 77°F [20° – 25°C]). **Do not freeze or expose to freezing temperatures.**

Shelf Life

Check expiration date on vial.

Instructions for Reconstitution and Use

Reconstitute just before use according to the manufacturer's instructions. Use only the diluent supplied to reconstitute the vaccine.

Shelf Life after Reconstitution, Thawing or Opening

Single-Dose Vials: Discard reconstituted vaccine if it is not used **within 30 minutes** of reconstitution. **Do not freeze reconstituted vaccine.**

Special Instructions

Rotate stock so that the earliest dated material is used first.

If this vaccine is stored at a temperature warmer than 5°F (-15°C), it will result in a loss of potency and a reduced shelf life. If a power outage or some other situation occurs that results in the vaccine storage temperature rising above the recommended temperature, the healthcare provider should contact Merck, the vaccine manufacturer, at 1-800-MERCK-90 for an evaluation of the product potency before using the vaccine.

Note: All vaccine materials should be disposed of using medical waste disposal procedures. Contact the state health department for details.

Manufacturer Quality Control Office Telephone Numbers

Manufacturer/Distributor	Telephone Number	Products
sanofi pasteur www.sanofipasteur.us	800-822-2463	DTaP, DTaP-Hib, DT, Td, Tdap, TT, Hib, Influenza (TIV), IPV, MCV4, MPSV4
Talecris Biotherapeutics www.talecrisusa.com/	800-520-2807	HBIG, IGIM, RIG, TIG
Centers for Disease Control and Prevention Drug Service www.cdc.gov/ncidod/srp/drugs/drug-service.html	404-639-3670	Distributor for Diphtheria antitoxin
Novartis www.novartis-vaccines.com/products/index.shtml	800-244-7668	Influenza (TIV)
GlaxoSmithKline www.gsk.com/	866-475-8222 (customer support) 888-825-5249 (customer support)	DTaP, DTaP-HepB-IPV,Tdap, HepA, HepB, HepA-HepB, Influenza (TIV)
Massachusetts Biological Labs	617-474-3000 617-983-6400	Td, IGIM, TT
MedImmune, Inc. www.medimmune.com	877-358-6478	Influenza (LAIV)
Merck www.merckvaccines.com	800-637-2590	Hib, Hib-HepB, HepA, HepB, HPV, Measles, Mumps, Rubella, MMR, MMRV, PPV23, Rotavirus, Varicella, Zoster
Nabi Biopharmaceuticals www.nabi.com	800-635-1766	HBIG
Wyeth www.wyeth.com	800-999-9384	Hib, PCV7

Appendix H: Resources, References, and Web Sites

Resources

This VA Influenza Manual 2009–2010 is available on the

- VA Internet sites

  http://www.publichealth.va.gov/flu

  www.publichealth.va.gov/InfectionDontPassItOn

- VA intranet sites (VA Staff Only)

  http://vaww.publichealth.va.gov/flu

  vaww.publichealth.va.gov/InfectionDontPassItOn

References

Guidance on Influenza Immunization

CDC. Update: Influenza Activity—United States, September 28, 2008—April 4, 2009, and Composition of the 2009–10 Influenza Vaccine. MMWR Morb. Mortal Wkly Rep. 2009 April 17 58(14);369-374. Available at: http://www.cdc.gov/mmwr/preview/mmwrhtml/mm5814a4.htm

Prevention and Control of Seasonal Influenza with Vaccines: Recommendations of the Advisory Committee on Immunization Practices (ACIP), 2009 July 31. Vol. 58 / No. RR–8; 1-52. Available at http://www.cdc.gov/mmwr/preview/mmwrhtml/rr5808a1.htm

VHA Directive: Influenza Vaccine-Recommendations for 2009–2010 can be accessed on the VHA Forms, Publications & Records Management site at http://www1.va.gov/vhapublications/publications.cfm?Pub=1

Guidance on Immunization/Vaccination in General

MMWR QuickGuide: Recommended Adult Immunization Schedule—United States, 2009. MMWR 2008;57(53). Available at: http://www.cdc.gov/mmwr/PDF/wk/mm5753-Immunization.pdf

General Recommendations on Immunizations: Recommendations of the Advisory Committee on Immunization Practices (ACIP). MMWR. December 1, 2006/55. Available at: http://www.cdc.gov/mmwr/preview/mmwrhtml/rr5515a1.htm

CDC: Syncope After Vaccination, United States, January 2005—July 2007. MMWR May 2, 2008/57(17): 457-460. Available at: http://www.cdc.gov/mmwr/preview/mmwrhtml/mm5717a2.htm

Vaccine Information Statements (VIS)

US Department of Health and Human Services, CDC. Available at: http://www.cdc.gov/vaccines/pubs/vis/default.htm

- Inactivated Influenza
- Live, Intranasal Influenza
- Pneumococcal Polysaccharide (PPV23)

Vaccination of Employees, Trainees, and Volunteers

Carman WF, et al. "Effects of influenza vaccination of health-care workers on mortality of elderly people in long-term care: a randomized controlled trial." Lancet 2000; 355:93-97.

"Immunization of Health Care Workers: Recommendations of the Advisory Committee on Immunization Practices (ACIP) and the Hospital Infection Control Practices Advisory Committee (HICPAC)," MMWR, December 26, 1997/46: -42. Available at: http://www.cdc.gov/mmwr/preview/mmwrhtml/00050577.htm (Web version) http://www.cdc.gov/mmwr/PDF/rr/rr4618.PDF (PDF file)

Influenza Vaccination of Health-Care Personnel Recommendations of the Health Care Infection Control Practices Advisory Committee (HICPAC) and the Advisory Committee on Immunization Practices (ACIP) February 24, 2006 / 55(RR02);1-16. Available at: http://www.cdc.gov/mmwr/preview/mmwrhtml/rr5502a1.htm

D'Heilly SJ, Nichol KL. Work-site-based influenza vaccination in health care and non-health care settings. Infect Control Hosp Epidemiol. 2004 Nov; 25(11):941-5.

National Foundation for Infectious Diseases. Influenza Immunization Among Health Care Personnel (2008). Available at: http://www.nfid.org/pdf/publications/fluhealthcarecta08.pdf

National Foundation for Infectious Diseases. "Improving influenza vaccination rates in health care workers," 2004. Available at: http://www.nfid.org/ (Web version) http://www.nfid.org/pdf/publications/hcwmonograph.pdf (PDF file)

Slavin, KE. AAOHN J. 2008 Mar; 56(3):123-8. "American Nurses Association's best practices in seasonal influenza immunization campaign."

Polgreen, PM, Chen Y, Beekmann, S, Srinivasan A, Neill MA, Gay T, Cavanaugh JE. Clin Infect Dis. 2008 Jan 1; 46(1):14-9. ; "Infectious Diseases Society of America's Emerging Infections Network."

The Joint Commission (2009). *Providing a Safer Environment for Health Care Personnel and Patients Through Influenza Vaccination: Strategies from Research and Practice.* Oakbrook Terrace, Illinois: The Joint Commission. Available at: http://www.jointcommission.org/PatientSafety/InfectionControl/flu_monograph.htm

Simeonsson K, Summers-Bean C, Connolly A., Influenza vaccination of health care workers: institutional strategies for improving rates, N C Med J. 2004 Nov-Dec;65(6): 323-9.).

"Factorial Design for Improving Influenza Vaccination Among Employees of a Large Health System" Richard Kent Zimmerman, MD; Mary Patricia Nowalk, PhD, Chyongchiou J Lin, PhD; Mahlon Raymund, PhD; Dwight E Fox, DMD; Jay D Harper, MD; Mark D Tanis, RN; Bayo C Willis, MPH. Infection Control and Hospital Epidemiology July 2009 Volume 30 Number 7 pages 691-697. Available at: http://www.journals.uchicago.edu/doi/full/10.1086/598343?prevSearch=%28%28Factorial+Design+for+Improving+Influenza+Vaccination+Among+Employees+of+a+Large+Health+System%29+AND+%5Bjournal%3A+iche%5D%29%29&searchHistoryKey

Vaccination of Veterans, Patients, and the Public

Rothberg MB, Haessler SD, Brown RB. Am J Med. 2008 Apr; 121(4):258-64. "Complications of viral influenza."

Bartell JC, Roberts KA, Schutte NJ, Sherman KC, Muller D, Hayney MS.

Clin J Pain. 2008 Mar-Apr; 24(3):260-4. "Needle temperature effect on pain ratings after injection."

Gamble GR, Goldstein AO, Bearman RS. J Am Board Fam Med. 2008 Jan-Feb; 21(1):38-44. "Implementing a standing order immunization policy: a minimalist intervention."

Bader, MS. Am J Med Sci. 2007 Dec; 334(6):481-6. "Immunization for the elderly."

Reynold, Cara Egan, MHS; Snow, Vincenza, MD, FACP; Qaseem, Amir, MD, PhD, MHA; and Verbonitz, Lia, MPH. "Improving Immunization Rates: Initial Results From a Team-Based Systems Change Approach", American Journal of Medical Quality, Vol 23: No 3: May/June 2008: 176-183. Available at: http://ajm.sagepub.com/cgi/reprint/23/3/176

Jha, AK, Wright, SM, & Perlin, JB. "Performance Measures, Vaccinations, and Pneumonia Rates Among High-Risk Patients in Veterans Administration Health Care", Journal of Public Health, Vol 97: No 12: December 2007; 2167-2172. Available at: http://www.ajph.org/cgi/content/full/97/12/2167

Keyhani et al. "Use of Preventive Care by Elderly Male Veterans Receiving Care Through the Veterans Health Administration, Medicare Fee-for-Service, and Medicare HMO Plans". Journal of Public Health, December 2007, Vol 97, No 12: 2179-2185. Available at: http://www.ajph.org/cgi/content/full/97/12/2179

VA. "Maximizing Vaccination Rates for Veterans with SCI&D, VA QUERI Quarterly Newsletter". Vol 3: No 4: March 2002. Available at: http://www.hsrd.research.va.gov/publications/queri_quarterly/ (Web version) http://www.hsrd.research.va.gov/publications/internal/QUERIvol3no4Spring.pdf (PDF file)

CDC. "Vaccine-Preventable Diseases: Improving Vaccination Coverage in Children, Adolescents, and Adults (TFCPS)," MMWR, June 18, 1999/48: 1-15. Available at: http://www.cdc.gov/mmwr/preview/mmwrhtml/rr4808a1.htm (Web version) http://www.cdc.gov/mmwr/PDF/rr/rr4808.pdf (PDF File)

"Adult Immunization Programs in Nontraditional Settings: Quality Standards and Guidance for Program Evaluation" and "Use of Standing Orders Programs to Increase Adult Vaccination Rates (APIC)," MMWR, March 24, 2000/49: 1-26. Available at: http://www.cdc.gov/mmwr/preview/mmwrhtml/rr4901a1.htm (Web version) http://www.cdc.gov/mmwr/PDF/rr/rr4901.pdf (PDF file)

Immunization Action Coalition. Adults Only Vaccination: A Step-by-Step Guide [PDF Files] (166- pages) Available at: http://www.immunize.org/guide/aovguide_all.pdf (PDF file)

CDC. "Influenza Vaccination Levels Among Persons Aged >65 Years and Among Persons Aged 18–64 Years with High-Risk Conditions—United States, 2003" MMWR October 21, 2005 / 54(41);1045-1049. Available at: http://www.cdc.gov/mmwr/preview/mmwrhtml/mm5441a3.htm

Jacobson VJ, Szilagyi P. Patient reminder and patient recall systems to improve immunization rates. Cochrane Database Syst Rev. July 20, 2005; (3): CD003941. Abstract and synopsis available at: http://www.mrw.interscience.wiley.com/cochrane/clsysrev/articles/CD003941/frame.html

Nichol KL. "Benefits of Influenza Vaccination for Low-, Intermediate-, and High-Risk Senior Citizens." Archives of Internal Medicine, 1998;158: 1769.

Nichol KL. "Ten-Year Durability and Success of an Organized Program to Increase Influenza and Pneumococcal Vaccination Rates Among High-Risk Adults." American Journal of Medicine, 1998;105:385-92.

Nichol KL. "Influenza Vaccination for Healthy Working Adults." Minnesota Medicine, November 1999; Volume 82. Available at: http://www.mnmed.org/publications/MnMed1999/November/Nichol.cfm

Nichol KL. "Influenza Vaccination and Reduction in Hospitalizations for Cardiac Disease and stroke Among the Elderly," New Engl J Med, 2003;348:1322-1332.

Nichol KL, D'Heilly S, Ehlinger, E. Colds and influenza-like illnesses in university students: impact on health, academic and work performance, and health care use. Clin Infect Dis. 2005 May 1;40(9):1263-70. Epub 2005 Mar 31.

Polarid GA, et al. "Standards for Adult Immunization Practices," Am J Prev Med 2003;25:144-150.

Szilagyi PG, et al. "Effect of Patient Reminder/Recall Interventions on Immunization Rates," JAMA 2000;284 1820-1827. Available at: http://jama.ama-assn.org/cgi/content/abstract/284/14/1820?maxtoshow=&HITS=10&hits=10&RESULTFORMAT=&fulltext=Effect+of+Patient+Reminder%2FRecall+Interventions+on+Immunization+Rates&searchid=1&FIRSTINDEX=0&resourcetype=HWCIT

Stone E. et al. "Interventions That Increase Use of Adult Immunization and Cancer Screening Services: A Meta-Analysis," Annals of Internal Medicine, 2002;136;641-651. http://www.annals.org/issues/v136n9/full/200205070-00006.html (Web version) http://www.annals.org/issues/v136n9/pdf/200205070-00006.pdf (PDF File)

Cost Effectiveness of Influenza Vaccination

Nichol KL. The efficacy, effectiveness and cost-effectiveness of inactivated influenza virus vaccines. Vaccine. 2003 May 1;21(16):1769-75.

Nichol KL, Goodman M. Cost effectiveness of influenza vaccination for healthy persons between ages 65 and 74 years. Vaccine. 2002 May 15;20 Suppl 2:S21-4.

Nichol KL. Cost-benefit analysis of a strategy to vaccinate healthy working adults against influenza. Arch Intern Med. 2001 Mar 12;161(5):749-59.

Nichol KL. Influenza vaccination in the elderly: impact on hospitalization and mortality. Drugs Aging. 2005;22(6):495-515.

Pneumococcal Vaccination

CDC. "Interim Guidance for Use of 23-Valent Pneumococcal Polysaccharide Vaccine During Novel Influenza A (H1N1) Outbreak", June 9, 2009. Available at http://www.cdc.gov/h1n1flu/guidance/ppsv_h1n1.htm#

CDC. "Surveillance of Certain Health Behaviors and Conditions Among States and Selected Local Areas—Behavioral Risk Factor Surveillance System (BRFSS), United States, 2006"; MMWR August 15, 2008 / 57(SS07);1-188. Available at: http://www.cdc.gov/mmwr/preview/mmwrhtml/ss5707a1.htm

CDC. "Guidelines for preventing health-care-associated pneumonia, 2003: recommendations of CDC and the Health Care Infection Control Practices Advisory Committee," MMWR/March 26, 2004; 53(RR03):1-35. Available at: http://www.cdc.gov/mmwr/preview/mmwrhtml/rr5303a1.htm (Web version) http://www.cdc.gov/mmwr/PDF/rr/rr5303.pdf (PDF File)

CDC. "Prevention of Pneumococcal Disease: Recommendations of the Advisory Committee on Immunization Practices (ACIP)," MMWR, April 4, 1997/46: 1-23. Available at: http://www.cdc.gov/mmwr/preview/mmwrhtml/00047135.htm (Web version) http://www.cdc.gov/mmwr/PDF/rr/rr4608.pdf (PDF File)

CDC. "Influenza vaccination coverage among adults aged >50 years and pneumococcal vaccination coverage among adults aged >65 years—United States, 2002," MMWR 2003;52(41):987-992. CDC. Questions About the Pneumococcal Vaccine brochure. Available at: http://www.cdc.gov/vaccines/vpd-vac/pneumo/vac-pneumo-pubs.htm

Improving Influenza, Pneumococcal Polysaccharide, and Hepatitis B Vaccination Coverage Among Adults Aged <65 Years at High Risk, MMWR, April 1, 2005 / 54(RR05);1-11. Available at: http://www.cdc.gov/mmwr/preview/mmwrhtml/rr5405a1.htm

A Report on Recommendations of the Task Force on Community Preventive Services. Available at: http://www.cdc.gov/mmwr/preview/mmwrhtml/rr5405a1.htm

Web Sites

Department of Veterans Affairs

http://www.publichealth.va.gov/flu/
VA Intranet vaww.publichealth.va.gov/flu
Influenza Web sites for the Department of Veterans Affairs. These include links on the influenza virus and influenza vaccine, VA policy and guidance on influenza, and VA resources for implementation of seasonal influenza vaccination campaigns.

http://www.publichealth.va.gov/InfectionDontPassItOn
VA Intranet http://vaww.publichealth.va.gov/InfectionDontPassItOn
Web sites for the VA public health campaign "Infection: Don't Pass It On," which focuses on prevention of infection within the VA medical system through hand and respiratory hygiene, resources for infection emergencies and vaccination against influenza and pneumonia.

http://www.prevention.va.gov
This Web site of the VA National Center for Health Promotion and Disease Prevention (NCP) has links to prevention resources for clinicians and veterans.

Federal Government

http://flu.gov
This site is the new official Federal Web site that provides information on novel A H1N1 influenza, seasonal and pandemic influenza information.

http://www.cdc.gov/vaccines
This is the Web site for the National Immunization Program of the Centers for Disease Control and Prevention (CDC) and has a great deal of information for the public and health care providers on all immunization topics.

http://www.cdc.gov/h1n1flu/
This is the main Novel H1N1 Influenza Web page of the CDC and provides information and situation updates for the public and health care providers.

http://www.cdc.gov/vaccines/recs/acip/default.htm
This page on the NIP site lists all recommendations of the ACIP (Advisory Committee for Immunization Practices).

http://www.cdc.gov/vaccines/recs/schedules/adult-schedule.htm
This page includes a printable schedule of adult immunization recommendations, a list of vaccines for adults, and an adult vaccination screening form.

http://www.cdc.gov/flu/weekly/fluactivity.htm
This page provides weekly updated reports about national and international influenza activity and has fundamental information concerning influenza surveillance methods.

http://www.cdc.gov/vaccines/recs/rate-strategies/adultstrat.htm
This page includes strategies for Increasing Adult Vaccination Rates (NIP), Updated May 22, 2007.

http://www.cdc.gov/flu/
This is the main influenza Web page of the CDC. It includes extensive information about the disease of influenza and its prevention and control, for patients and health care professionals.

http://www.fda.gov/cder/drug/antivirals/influenza/
This Web page from the Food and Drug Administration has links for influenza vaccine information, and antiviral drug information.

http://www.fda.gov/BiologicsBloodVaccines/SafetyAvailability/VaccineSafety/ucm110288.htm
FDA Web page on Influenza Vaccine Safety & Availability.

http://www.fda.gov/BiologicsBloodVaccines/GuidanceComplianceRegulatoryInformation/Post-MarketActivities/LotReleases/ucm162050.htm|
FDA List of Strains Included in the 2009–2010 Influenza Vaccine.

Non Federal Government

http://www.immunize.org

This is the Web site for the Immunization Action Coalition (IAC) with a wide variety of information about immunizations, including Vaccine Information Statements in many languages. The Directory of Immunization Resources is full of useful information on organizations, Web sites, hotlines, and agencies that are immunization resources.

http://www.vaccineinformation.org/

This page from the IAC is comprehensive, organized, and easy to access. For each vaccine-preventable disease, there are answers to many questions about the disease and the vaccine, as well as sections containing photos, case histories, recommendations, references, and links to useful resources. Also included is material about vaccine safety, travel, bioterrorism, state laws—and much more. Has information in Spanish.

http://www.acponline.org/aii

This site from the American College of Physicians provides resources and tools to support physicians in their immunization efforts, with the goal of improving adult immunization rates. It includes physician education, patient education, and practice management tools for immunization and reimbursement.

http://www.nfid.org/

This is the Web site for the National Foundation for Infectious Diseases and contains a call to action and strategies for increasing influenza immunization among employees, trainees, and volunteers.

http://www.vaccines.org

This Web site provides access to up-to-the-minute news about vaccines and an annotated database of vaccine resources on the Internet.

http://www.ImmunizationEd.org

This is a Web page from the Group on Immunization Education of the Society of Teachers of Family Medicine. On this site you will find news and reports to keep family physicians up-to-date on vaccines for children and adults, links to the most current immunization schedules and vaccine information, downloadable slide presentations and photographs of diseases.

http://www.atpm.org/

This Web site of the Association of Teachers of Preventive Medicine has several educational resources available for download or purchase for training health care professionals and students about immunization issues.

http://www.naccho.org/

This is the Web site of the National Association of County and City Health Officials and has several pages of vaccine information, with links to training and resources pages.

http://www.whathealth.com/organizations/n/natpartimmunization-us.html

This Web site of the National Partnership for Immunization, a non-profit organization dedicated to reducing the nationwide incidence of vaccine-preventable diseases through increased use of licensed vaccines, funded, in part, by the Centers for Disease Control and Prevention, is a good source for immunization resources.

http://www.nlm.nih.gov/medlineplus/influenza.html
This is the influenza Web page of Medline Plus, a service of the National Library of Medicine, National Institutes of Health (NIH). It includes sections on news, diagnosis, treatment, prevention, disease management, clinical trials and other research, and information focused on audiences ranging from children to the elderly.

http://www.mayoclinic.com/invoke.cfm?objectid=5CB89570-8B46-4961-8BFE66D06D5BDD1B
This is the Mayo Clinic patient information page on influenza.

http://www.health.state.mn.us/divs/idepc/diseases/flu/index.html
This is the influenza section of the Minnesota Department of Health.

http://www.medscape.com/resource/influenza
On this site you find comprehensive clinical information and educational tools for clinicians and other health care professionals.

Pandemic & 2009 H1N1 Influenza Web Sites

Department of Veterans Affairs

2009 Novel H1N1 Influenza Information
http://www.publichealth.va.gov/h1n1flu/
VA intranet http://vaww.publichealth.va.gov/h1n1flu/
Provides general information and guidance on 2009 novel H1N1 and flu prevention for veterans and VA staff.

VA Pandemic Influenza Information
http://www.pandemicflu.va.gov/
VA Intranet http://vaww.pandemicflu.va.gov/
These sites contains VA Pandemic Influenza Plan and links to other documents, including information on use of the antiviral drug oseltamivir, respiratory infectious disease emergency plan for facilities, hand and respiratory hygiene, personal protective equipment.

Federal Government

Centers for Disease Control and Prevention—novel influenza A (H1N1)
http://www.cdc.gov/h1n1flu/
This site contains links to key facts on novel influenza A (H1N1), the virus and its spread, prevention outbreaks, information and guidance.

Federal/State Government Influenza Information
http://flu.gov
This site is the new official Federal Web site that provides information on 2009 novel influenza A (H1N1), seasonal and pandemic influenza information.

Federal Government Information
http://www.pandemicflu.gov/plan/tab1.html
This site contains links to national strategy, federal agency activities, information for federal employees.

World Health Organization

International Pandemic Influenza Information

http://www.who.int/csr/disease/swineflu/en/index.html

This site contains links to advice for travelers, world regional 2009 H1N1 influenza information, country activities, outbreak news and timeline planning; business, school, health care, and community planning; influenza watch and meeting update.

Appendix I: Acknowledgements

This manual is developed by the *Infection: Don't Pass It On (IDPIO)* campaign. IDPIO is an ongoing public health campaign to involve VA staff, veterans, their families and visitors in preventing the transmission of infection.

The campaign develops and distributes education and communication resources for the VA community to promote:

- hand hygiene and respiratory etiquette,
- annual seasonal influenza vaccination,
- correct and appropriate use of personal protective equipment,
- pandemic influenza preparedness and response, and
- basic public health measures to prevent transmission of infection.

IDPIO Coordinating Offices

Office of Public Health & Environmental Hazards

- Troy Knighton, EdS, LPC, Senior Program Manager
  Public Health Strategic Health Care Group,
  VA Central Office (campaign coordinator)
- Pamela Hirsch, NP-C, BS, MEd, MS, Clinical Program Manager Occupational Health,
  Occupational Health, Safety, & Prevention Strategic Health Care Group, VA Central Office
- Connie Raab, BA, Director, Public Health Communications
  Office of Public Health & Environmental Hazards, VA Central Office
- Donna Wells-Taylor, BS, RRT, Program Manager
  Public Health Strategic Health Care Group, VA Central Office

VA Employee Education System

- Lorraine Bem, EdD, RN National Project Manager/ANCC Nurse Planner, Birmingham
  Employee Education Resource Center

VA Clinical and Infection Control Professionals

- Jonna Benton, RN, Women Veteran Program Manager, VA Montana Health Care System
- Pamela Del Monte, MS, RN-BC, ACNS, Associate Chief Nurse, Ambulatory Care, Durham VAMC
- Kathleen De Roos, APRN, MSN, CIC, VISN 23 Infection Prevention Coordinator
- Vicki Macks, RN, BSN, CNOR, CIC, MRSA Prevention Coordinator, Memphis VAMC
- Scott E. Mambourg, PharmD, BCPS; Clinical Pharmacy Coordinator, Reno VAMCS
- Phyllis Ogletree, CRNP, COHN-S, Nurse Practitioner/Occupational Health, Biloxi VAMC
- Mary Standridge, RN, MSN, CIC, Infection Control Nurse, Memphis VAMC
- Beverly F. VanMetre, RN, BSN, MS, CHES, Clinical Programs Coordinator, Martinsburg VAMC

Infectious Diseases Program Office

- Linda H. Danko, RN, MSN, Clinical Program Coordinator, Infectious Diseases Program, VA Central Office
- Rosie Fardo, RN, CIC, Infection Control Practitioner, Infectious Diseases Program, VA Central Office
- Marian Rodgers, RN, MSN, MPH, CIC, Infection Control Practitioner, Infectious Diseases Program, VA Central Office

VHA National Center for Health Promotion and Disease Prevention

- Kathleen Pittman, RN, MPH, Program Manager, Prevention Practice, National Center for Health Promotion and Disease Prevention, Office of Patient Care Services

VA National Center for Patient Safety

- Noel Eldridge, MS, Executive Assistant, VA Central Office
- Jacqueline Parker, RN, MS, MPH, Patient Safety Officer, VISN3 – NY/NJ HCS

For their leadership, expertise, and dedication to influenza prevention efforts in the VA medical system and the IDPIO campaign, the IDPIO coordinating team would like to acknowledge:

Vicky Davey, PhD, MPH, RN, Deputy Chief Officer, Office of Public Health and Environmental Hazards, VA Central Office,

Cynthia L Gibert, MD, MSc, Professor of Medicine, George Washington University Medical Center, Director of Special Projects Medical Service, Washington DC VA Medical Center,

Stephen M. Kralovic, MD, MPH, Staff Physician Cincinnati VA Medical Center and Medical Epidemiologist, Infectious Diseases Program, VA Central Office,

Kristin L. Nichol, MD, MPH, MBA, Associate Chief of Staff for Research, Minneapolis VA Medical Center, and

Ronald O. Valdiserri, MD, MPH, Chief Consultant, Public Health Strategic Health Care Group, VA Central Office.

Special thanks to our colleagues in these organizations who are instrumental in VA's seasonal influenza campaign efforts:

VA Office of Quality and Performance

VA Pharmacy Benefits Management Strategic Health Care Group

VA National Acquisitions Center

and the

Department of Health and Human Services, National Vaccine Program Office

Infection: Don't Pass It On Campaign
U.S. Department of Veterans Affairs
VA Central Office (13B)
810 Vermont Ave, NW
Washington, DC 20420
202-461-1040
publichealth@va.gov
September 2009

Intranet sites (VA staff only)
vaww.publichealth.va.gov/flu
vaww.publichealth.va.gov/InfectionDontPassItOn

Internet sites
www.publichealth.va.gov/flu
www.publichealth.va.gov/InfectionDontPassItOn

VA Influenza Manual 2009 / 2010

September 2009